CORNELL UNIVERSITY

OFFICIAL PUBLICATION

DECEMBER 1, 1953

Graduate School

ANNOUNCEMENT
FOR SESSIONS OF
1954-55 AND 1955-56

Calendar, 1954-55

FALL TERM

	1954–55
Registration (new students and readmitted students first day).	Sept. 20–21
Instruction begins at 1 p.m.	Sept. 22
Language examinations in French and German.	Sept. 29
Instruction begins in French and German.	Oct. 4
Last day for filing statement-of-courses blank and change-of-committee blank and for new students to file candidacy blanks to receive residence credit for the term.	Oct. 5
Last day for payment of tuition for the term.	Oct. 12
Last day for taking qualifying and language examinations other than French or German in order to have them considered as of the beginning of the term.	Oct. 23
Thanksgiving recess. Instruction ends at 12:50 p.m., Nov. 24.	Nov. 24–28
Christmas recess. Instruction ends at 12:50 p.m., Dec. 18.	Dec. 18–Jan. 2
Last day for completing all requirements (including payment of graduation fees) for February degrees.	Jan. 21
Term ends.	Feb. 2

SPRING TERM

Registration for old students.	Jan. 24
Registration for new students and readmitted students.	Feb. 5
Instruction begins at 8 a.m.	Feb. 7
Language examinations in French and German.	Feb. 14
Last day for filing statement-of-courses blank and change-of-committee blank and for new students to file candidacy blanks to receive residence credit for the term.	Feb. 19
Last day for filing applications for scholarships and fellowships for the following fall term.	Feb. 21
Instruction begins in French and German.	Feb. 21
Last day for payment of tuition for the term.	Feb. 28
Last day for taking qualifying and language examinations other than French and German to have them considered as of the beginning of the term.	March 4
Spring recess. Instruction ends at 12:50 p.m., March 26.	March 26–April 3
Last day for completing all requirements (including payment of graduation fees) for June degrees.	May 26
Term ends.	June 7
Commencement.	June 13

SUMMER

Summer Research period begins.	June 8
Registration for Summer Session.	July 6
Last day for filing statement-of-courses blank and change-of-committee blank and for new students to file candidacy blanks to receive residence credit for the summer.	July 13
Summer Session ends.	Aug. 15
Last day for completing all requirements (including payment of graduation fees) for September degrees.	Sept. 8
Summer Research period ends.	Sept. 17

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FIELDS OF INSTRUCTION

Administration

DEANE W. MALOTT, A.B., M.B.A., LL.D., *President of the University.*
THEODORE P. WRIGHT, B.S., D.Sc., *Vice President for Research.*
SANFORD S. ATWOOD, B.A., M.A., Ph.D., *Dean of the Graduate School.*
DAYTON J. EDWARDS, B.S., Ph.D., *Acting Associate Dean of the Graduate School of Medical Sciences.*
FREDERICK B. AGARD, B.A, M.A., Ph.D., *Secretary of the Graduate Faculty.*
MAYFRED STIMMING, B.S. in Ed., *Administrative Secretary.*

General Committee

Professor WILLIAM R. SEARS, *at large, term expires 1955.*
Professor JOHN G. B. HUTCHINS, *at large, 1955.*
Professor TREVOR B. CUYKENDALL, *at large, 1957.*
Professor HENRY M. MUNGER, *at large, 1957.*

Professor WALTER H. FRENCH, *Group* I *(Humanities), 1955.*
Professor MAX BLACK, *Group* I *(Humanities), 1957.*

Professor MARGARET HUTCHINS, *Group* II *(Social Sciences), 1955.*
Professor ROBIN M. WILLIAMS, JR., *Group* II *(Social Sciences), 1957.*

Professor B. L. HERRINGTON, *Group* III *(Biological Sciences), 1955.*
Professor GUSTAVE A. SWANSON, *Group* III *(Biological Sciences), 1957.*

Professor A. BERRY CREDLE, *Group* IV *(Physical Sciences), 1955.*
Professor PAUL J. FLORY, *Group* IV *(Physical Sciences), 1957.*

THE SECRETARY OF THE FACULTY, *ex officio.*
THE DEAN, *Chairman ex officio.*

The office of the Graduate School is in Edmund Ezra Day Hall, Room 125. The office hours are 8:30 a.m. to 12:00 m. and 1:00 p.m. to 4 p.m.

The Graduate School

THE GRADUATE SCHOOL offers facilities for advanced study and research so that students may obtain a comprehensive view of a field of knowledge and receive the training required for independent investigation in that field. In providing this opportunity, the School makes it possible for the students to associate freely with mature scholars who will give them such aid and direction as they may need. Accomplishment is judged primarily by the evidence of growing responsibility for the advancement of knowledge and not by fulfillment of routine requirements or by courses and credits. The Graduate Faculty requires of all candidates for advanced degrees a period of study in residence, the mastery of some one subject, an adequate acquaintance with allied subjects, the passing of a final examination, and the presentation of a satisfactory essay or thesis.

Within five years after Cornell University opened its doors to undergraduates in 1868, the Faculty admitted the first graduate student. Graduate instruction continued as a primary responsibility of the General, and later the University, Faculty until 1909, when the Graduate Faculty was established "with exclusive jurisdiction over all graduate work and any degree beyond the first degrees given by any school or college."*

The Graduate Faculty now consists of a permanent academic staff, numbering about six hundred, who are or who have been members of Special Committees directing candidates for advanced general degrees. This Faculty, with a few exceptions, is drawn from the University Faculty, which exceeds one thousand members. The General Committee is the administrative board of the Graduate Faculty, elected by the Faculty in part to represent Groups having common interests and in part to represent the Faculty as a whole. The Dean of the Graduate School is chairman ex officio.

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*On the recommendation of the Graduate Faculty, the Board of Trustees has established the Graduate School of Medical Sciences in New York City. With the annual approval of the Graduate Faculty, the Faculty of Medicine exercises complete jurisdiction over graduate instruction in that School, including programs leading to the degrees of Master of Science and Doctor of Philosophy. Because of the separate jurisdiction, this *Announcement* does not describe instruction in the Graduate School of Medical Sciences; inquirers interested in the instructional programs of that School should address the Associate Dean of the Graduate School, Cornell University Medical College, 1300 York Avenue, New York 21, N.Y., or consult the *Announcement of the Medical College.*

The following are advanced degrees which are also first degrees of a school or

ADVANCED GENERAL DEGREES
(M.A., M.S., and Ph.D.)

The Graduate Faculty distinguishes in purpose and in administration between two types of advanced degrees: *general* and *professional.*

The authority to establish and administer rules for admission to candidacy for, and for graduation with, the *advanced general degrees* of Master of Arts, Master of Science, and Doctor of Philosophy, except in the Graduate School of Medical Sciences, is exercised directly and solely by the Graduate Faculty without regard for collegiate or departmental lines. The training is designed to develop respect for truth and independent responsibility for achieving it. As far as is consonant with correct method, each candidate's program is individual and is planned to utilize all relevant resources of the University. However, for convenience in directing and executing these programs, the Faculty lists separate Fields of Instruction (specifically described below) and the principles of instruction inherent in each.

The regulations governing programs for advanced general degrees are published in a pamphlet entitled *Code of Legislation* of the Graduate Faculty, which is available for consultation in all offices of the University. What is stated in this *Announcement* is not regulatory but descriptive.

ADMISSION

To be admitted, an applicant (1) must hold a baccalaureate degree from a college or university of recognized standing, or have done work equivalent to that required for such a degree; (2) as judged by his previous scholastic record, or otherwise, must show promise of ability satisfactorily to pursue advanced study and research; and (3) must have had adequate preparation to enter upon graduate study in the Field chosen. Since instruction is largely individual, the professors in each Field have a restricted allotment of students. Therefore, it often happens that a qualified applicant cannot be accepted because the places available in a Field have been exhausted. Failure to admit

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college and therefore are not subject to the jurisdiction of the Graduate Faculty. For information regarding them, address the school or college indicated:

Bachelor of Laws	(Law School)
Master of Aeronautical Engineering	(Graduate School of Aeronautical Engineering)
Master of Business Administration	(School of Business and Public Administration)
Master of Nutritional Science	(School of Nutrition)
Master of Public Administration	(School of Business and Public Administration)
Doctor of Medicine	(Medical College, New York City)
Doctor of Veterinary Medicine	(Veterinary College)

an applicant is not to be regarded as a judgment that the applicant is unqualified.

Although applications may be filed at any time, the Admissions Committee cannot give assurance that an application for the fall term received after the preceding March 1, or for the Summer Session after May 1, will receive the same consideration that it would receive if filed before those dates.

Normally, an applicant is admitted as a candidate for a particular degree with his major study in a particular Field. Sometimes, either because the applicant is not certain of his plans or because the Admissions Committee is not certain of his ability or prerequisite training, he is admitted as a noncandidate (see p. 17) with the possibility of transferring to candidacy after a limited period of resident study.

Inquiries about admission and requests for application forms should be addressed to the Graduate School, 125 Edmund Ezra Day Hall, Cornell University, Ithaca, N.Y. An application for admission must be made on the proper form; it will not be acted upon until all credentials enumerated in the form have been received. Credentials not followed by an application are kept only one year. A withdrawn or refused application is kept in the inactive files for three years. A student may initiate reconsideration of such an application by sending a request for this action to the Graduate School.

In addition to presenting these credentials, any applicant residing in the United States is required to take the Graduate Record Examination Aptitude and Profile Tests and to have the scores forwarded to the office of the Graduate School if he is applying for major work in one of the following Fields: Conservation, English Language and Literature (*also* Advanced Test), Geology and Geography, History, Music, and Zoology. If for satisfactory reasons it is not feasible for an applicant in these Fields to take the examination before his application is considered, the Admissions Committee may act provisionally, pending submission of scores at a later date.

Although the test is not required in other Fields, the Admissions Committee welcomes submission of any Graduate Record Examination test scores as additional helpful data which it will consider in acting upon an application.

The Graduate Record Examination is administered four times each year throughout the United States and Canada. It does not require any special preparation and may be taken upon application and the payment of moderate fees. Inquiries about the examination and applications for taking it should be addressed to the Educational Testing Service, P.O. Box 592, 20 Nassau St., Princeton, N.J.

READMISSION...A candidate who maintains good standing may register in successive terms until he completes the degree for which he is

a candidate. Candidacy is canceled by (1) completion of requirements for the degree; (2) action of the General Committee upon evidence of failure to maintain good standing; (3) formal withdrawal arranged with the Dean; (4) failure to register during four successive years.

To be readmitted a student need not duplicate his original application and credentials, but he must submit a request in writing to the Dean stating desired date of readmission, Field of Study, and degree. In readmitting a student who has not registered for four or more years, the General Committee will stipulate what previous residence units may be recovered.

A student desiring to change from noncandidacy to candidacy or from a Master's degree to a Doctor's degree, without completing the former, must file a new Nomination-of-Committee blank with the Graduate School office.

A student who has fulfilled requirements for a Master's degree and who wishes to become a candidate for the doctorate must submit a written request to the Admissions Committee for its approval.

Duplication of Degrees

The Graduate Faculty receives occasional inquiries regarding candidacy for a second Master's or a second Doctor's degree, usually because the inquirer wishes to take major work in another field. Since the primary purpose of programs leading to advanced general degrees is acquirement of method and not acquirement of specific knowledge, the Graduate Faculty does not grant a second general degree at the same level. The holder of an advanced degree should consider applying as a noncandidate (see below). In justifiable instances, the holder of an advanced professional degree may become a candidate for an advanced general degree, or vice versa.

REGISTRATION

All students taking work in the Graduate School must register both in the Graduate School and with the Registrar of the University at the beginning of each term or session, including an approved period of Summer Research. For regular terms this registration takes place at Barton Hall on registration day. For the fall term, the Registrar notifies all students of the hour at which they are to report; if a graduate student does not receive notification at least a week before registration day, he should communicate with the Graduate School. For the spring term, the Registrar notifies only *readmitted* and *new students.* All others must pick up a registration permit card at Barton Hall prior to registration. Dates for obtaining such cards are posted in college offices and in the *Cornell Sun.* In the process of registration at Barton Hall, every graduate student must report to the table of the Graduate

School, where he will receive directions for completing his registration. Registration must be made in person, not by proxy. If a student cannot register at the appointed hour, he must report to the Graduate School office at the earliest time thereafter, bringing a written explanation endorsed by his adviser or chairman. A fee of $5 is required for late registration by matriculated students, not as a fine but as a payment of additional cost to the University for registering a student out of phase.

A registered student who for any reason discontinues his work during a term should immediately report that fact to the Graduate office in order to obtain an official withdrawal and any refund of tuition or fees to which he may be entitled.

MAJOR AND MINOR SUBJECTS

The curriculum of a candidate for the degree of M.A. or M.S. is one major and one minor subject; of a candidate for the degree of Ph.D., one major and two minor subjects. No variation in number of subjects is allowable. Approved subjects are listed below under the separate Fields of Instruction, where some information is given about them. Specific requirements for each subject are fixed by the member of the Faculty who represents the subject on the candidate's Special Committee; he requires whatever in his judgment is necessary to train the candidate, including registration for courses and seminars and supervised or independent study. Therefore, the program of one candidate bears no necessary relation to the program of another candidate registered for the same subject. The Faculty believes that in the main the ultimate aims of candidacy are best attained by the Candidate's selecting one minor subject (in certain instances two) outside the Field of his major subject. It also believes that candidates with major subjects in applied Fields usually should select minor subjects in basic Fields.

Within two weeks of first registration (one week for Summer Session) and after consultation with members of the Faculty, a candidate must record his selection of major and minor subjects with the Dean. Thereafter, the Faculty permits candidates to change subjects whenever a change appears to be beneficial and feasible, but any change must immediately be reported to the Dean for approval.

SPECIAL COMMITTEES

Special Committees are the means for directing individual candidates in the attainment of the scholarly independence implicit in advanced degrees. While a candidate is choosing his major and minor subjects, he selects eligible members of the Cornell staff to represent each subject and to serve as his Special Committee. The representative of the major subject is chairman. Any professor, associate professor, or

assistant professor, or any instructor who holds the degree of Ph.D., is eligible if his primary duties are Cornell University teaching and research on the Ithaca campus. If the candidate wishes, he may select two representatives for any subject; the second representative may be a member of the staff of the Agricultural Experiment Station at Geneva.

The members selected indicate their willingness to serve by signing the record of major and minor subjects, which is filed with the Dean.

A candidate may change the membership of his Special Committee with the approval of all the members of the newly constituted Committee and of the Dean.

Members of the Special Committee not only instruct or supervise the instruction of a candidate, but also certify each term whether his progress is satisfactory or unsatisfactory, conduct qualifying and final examinations, and approve the thesis. Although they are the candidate's advisers, the student alone is responsible for meeting the requirements of the University and the Graduate School.

RESIDENCE REQUIREMENTS

The Faculty regards study in residence as essential. Although requisite depth results from intensive study of a major subject and properly related minor subjects, living with students working in a variety of fields provides balance through association in libraries and laboratories, at lectures, recitals, and exhibitions, in graduate organizations with special or general aims, and from daily contacts in a university community.

Consequently, the Graduate Faculty requires of each candidate for a Master's degree a minimum of two residence units, and for the doctorate a minimum of six residence units. One residence unit represents one academic term of full-time study reported by the Special Committee as satisfactorily completed. The fractions of a unit which may be counted toward this requirement, namely, three-fourths, one-half, and two-fifths, are granted under the following conditions: (1) study while assisting or instructing in the academic program of the University; (2) study in Summer Session or in the Division of Extramural Courses; (3) study while employed in nonacademic work; (4) study which is reported by the Special Committee as only partially satisfactory. Except on petition, no graduate student may receive more than two residence units during any twelve consecutive months.

TRANSFER OF RESIDENCE...For the Master's degree, the only transferable residence is one Cornell Summer Session. For the doctorate, two residence units may be transferred, and with candidates who have demonstrated unusual ability more than two units may be granted upon petition. No commitment may be made for acceptance of previous study in another graduate school in lieu of required residence

until after the candidate has entered into study in residence in the Graduate School. Then the residence units recommended by the Special Committee on the basis of a transcript of record may not exceed those that would be earned under similar circumstances at Cornell. Study as a candidate or as a special student in an undergraduate college is not acceptable, even though the courses may be designed for graduate students. A candidate for the degree of Ph.D. must complete two of the last four units in successive terms of study on the Cornell campus.

CONTINUITY OF RESIDENCE. . . Each candidate for an advanced degree is expected to complete his study in residence with reasonable continuity. Under any circumstances, a candidate who fails to register during any period of four or more years is dropped from candidacy and may be readmitted only after the General Committee has stipulated the amount of additional residence to be required. No more than ten years may intervene between the time of first registration for and the completion of all requirements for a degree.

SUMMER RESEARCH. . . Under published regulations, candidates who have studied in residence for two semesters or more may receive one-half unit (in exceptional instances, three-fourths) for *Summer Research,* but no candidate may be recommended for the degree at an earlier date than if all his work had been done during the regular sessions of the academic year.

SUMMER SESSION. . . A normal program in the six-week Summer Session, approved in advance and reported as satisfactory by the Special Committee, is accepted as two-fifths of a unit, providing the candidate has registered in both the Summer Session and the Graduate School. Requirements for Masters' degrees may be completed solely in the Summer Sessions, if instruction in the chosen major and minor subjects is offered. Only two residence units (in exceptional instances, three) for study in the Summer Session may be accepted in fulfillment of requirements for the doctorate. In order to help a student become acquainted with the School and Faculty before entering candidacy, the Faculty allows the transfer of one Summer Session of study before admission to candidacy as two-fifths of a residence unit in fulfillment of requirements in candidacy.

DIVISION OF EXTRAMURAL COURSES. . . Under published regulations, candidates employed within and outside the University may be granted up to one residence unit for work in the Division of Extramural Courses, which offers instruction in certain Fields both on and off the campus.

LANGUAGE REQUIREMENTS

All candidates who need to demonstrate proficiency in French or German are required to pass a general written examination in that language. The examination will consist of one of four passages (Humanities, Social Sciences, Biological Sciences, or Physical Sciences) designed to test the student's ability to translate a representative piece of prose. The examination will be graded "pass" or "fail" on the basis of whether the student has demonstrated sufficient speed and accuracy to make language a useful instrument for research. The use of a dictionary is allowed. Passing this examination is the minimal requirement for demonstrating proficiency. The examination will be offered one week following registration in the fall, spring, and summer terms concurrently to candidates in all four Groups.

INSTRUCTION IN FRENCH AND GERMAN. . . Courses designed specifically to train graduate students to read French and German at a level of facility adequate for accurate research are given by the Division of Modern Languages in cooperation with the Graduate Faculty. There are four courses — one semester each of elementary and intermediate instruction in both French and German. The sections will be limited in size and will meet three hours each week. The Graduate Faculty believes that a student of graduate caliber can prepare himself for demonstration of proficiency by completion of the elementary and intermediate courses plus assigned readings in his particular Group.

Registration in these courses (the only formal courses directly administered by the Graduate School) is a commitment with the same implications as other undergraduate and graduate formal course offerings, including regular attendance and marks recorded on the transcript of record of the Registrar. A declaration that the student has prior or more important commitments, including academic commitments, is not in itself a justification for cancellation. *Because the demand for such instruction may exceed facilities, students who are in residence at Cornell need to preregister with the Graduate School.*

ELEMENTARY FRENCH or GERMAN 151. Credit three hours. M W F 4:30–5:30 or 7:00–8:00 p.m.

INTERMEDIATE FRENCH 152. Credit three hours. M W F 4:30–5:30.

INTERMEDIATE GERMAN 152. Credit three hours. M W F 7:00–8:00 p.m.

FOR THE MASTER'S DEGREE. Students taking major work in certain Fields are required to have reading knowledge of foreign languages, as indicated under the separate Fields of Instruction, where the language or languages required and the time and the method of fulfilling the requirements are stated. If the Field requires *proficiency* in French or German, the candidate must pass a scheduled examination

(see above). If a language other than French or German is acceptable, the candidate must request at the Graduate Office for assignment of an examination; the examination must be passed within one month of first registration, unless the Field stipulates a later time. If the Field requires *college-entrance language,* the candidate's transcript of record must indicate that he has passed three college entrance units in one language, two units in each of two languages, or the equivalent in collegiate study; if his transcript does not indicate that he has met this requirement, he must demonstrate proficiency in one language, as described above. A candidate who does not demonstrate proficiency will be required to complete a minimum of three residence units for the degree and must demonstrate proficiency before beginning the third residence unit. The extra unit may be waived if preparation in the language is made during a period when the candidate is not receiving residence credit. *Any Special Committee may, in its discretion, require knowledge of foreign language beyond the announced requirements.*

FOR THE DEGREE OF PH.D.....Every candidate whose native language is English must demonstrate his ability to read French and German. Another language may be substituted for French or German if the Special Committee attests to the Dean that the relative amount, quality, and pertinence of scholarly or scientific writing in the candidate's approved major and minor subjects are superior in the substituted language. The examination in at least one foreign language must be passed immedately upon admission to candidacy; otherwise, a minimum of seven residence units is required. The extra unit may be waived by the General Committee upon recommendation of the candidate's Special Committee if preparation in foreign language is made during a period when the candidate is not receiving residence units. The second language examination should be taken as soon as possible after admission to candidacy. Until it is passed, no residence units beyond four will be allowed. Examination in other than French or German passed within one month after registration are considered as being passed at the time of registration.

Foreign students may, under regulation, offer English as one foreign language.

COURSES AND REGISTRATION OF COURSES

The Graduate School is not a course-offering agency, and courses and course credits are not directly a part of programs leading to advanced general degrees. The Graduate Faculty has never formally differentiated between undergraduate and graduate courses offered by the cooperating departments, schools, and colleges; nor has it regulated the type or number of courses which a graduate student may take. The Special Committee of a candidate is exclusively the judge of

whether he can efficiently prepare himself for its requirements by formal participation or visiting courses or seminars or by other means. On recommendation of the Special Committee and with the consent of the instructor, a graduate student may register for any course offered by any department, school, or college of Cornell University. Completion of courses creates no necessary presumption that the student's progress is satisfactory; this judgment is rendered only by the Special Committee.

However, as a service to candidates who need evidence of completed courses for their Special Committees and for other purposes later, and to the University administrators of course instruction, each candidate is required to register with the Graduate School office within two weeks of the beginning of each term (one week in Summer Session) all the courses and seminars he plans to take. Any change in this program must be reported immediately to the Graduate office.

All courses and seminars of interest to candidates are described in the Announcements of the schools and colleges, which are sent upon request to the office of Official Publication, Cornell University. In the description of Fields of Instruction below, the name of the school or college offering courses in each Field is given in parentheses immediately after the name of the Field. Also, the Registrar of the University issues the University *Schedule of Courses,* which lists (without descriptions) all courses offered in the University in any particular term. Courses and seminars exclusively or primarily for graduate students are offered in all Fields of Instruction.

PREREGISTRATION...New students ordinarily need not preregister, but for those who expect to take laboratory courses with limited facilities, it may be advisable to consult with their Field Representative or major adviser. The Graduate School Office notifies students in residence regarding the times at which they need to preregister for courses given in the fall and spring terms.

EXAMINATIONS REQUIRED BY THE GRADUATE FACULTY

Three oral or oral and written examinations are required by the Graduate Faculty: (1) a Final Examination for the Master's degree; (2) a Qualifying Examination for the degree of Ph.D.; (3) a Final Examination for the degree of Ph.D. Under certain regulations (1) and (2) may be combined. Although other members of the Faculty may be invited to examine the candidate, the Special Committee alone decides whether he has passed or failed. The Qualifying Examination has the double purpose of determining the ability of the candidate to pursue doctoral studies and of allowing the Special Committee and candidate to plan together a satisfactory program for completion of

candidacy. The Qualifying Examination should be taken as early as possible; at all events, the candidate must complete at least three units of residence after passing it. The Final Examination for the doctorate may be given in two parts — one part on major and minor subjects (Examination A), which may be taken at the end of the fourth unit of residence; the second part on the thesis and related material (Examination B), which is taken after the thesis is approved by the Special Committee. Examinations A and B may be combined into one examination (Examination C). Final Examinations B and C are scheduled by the Dean and are announced to the Graduate Faculty so that any member may attend who wishes to do so.

The Special Committee may require any examinations in addition to these three which it deems desirable.

ESSAYS AND THESES

Programs in candidacy for the Master's degree are intended to be individually planned and may range widely in content and method. Depending upon the desires and needs of the candidate and the discretion of the Special Committee, they may be composed largely of courses in broad or restricted fields or of informal study under guidance; they may be designed to terminate formal education or to prepare for further advanced study; they may center in a single problem or investigation, or the thesis or essay may be secondary.

At least five office days before the Final Examination, each Master's or Doctor's candidate must submit a thesis (or essay) approved by all members of his Special Committee and acceptable to the Graduate Faculty in both scholarship and literary quality. The doctoral thesis must also demonstrate the candidate's respect for truth and independent responsibility for achieving it. Ordinarily, but not necessarily, the thesis is written in the candidate's major field and under the direction of the chairman of his Special Committee.

In conformity with the desire of the Graduate Faculty for the widest possible circulation and criticism of theses and the material of theses, theses may not be classified or otherwise restricted in circulation. The Faculty requires the publication of abstracts and the microfilming of doctoral theses through University Microfilms, Inc.

ADVANCED PROFESSIONAL DEGREES

Advanced professional degrees are designed as preparation and training for a special profession. The admissions, requirements, and curricula for such degrees, as approved by the Graduate Faculty, are announced and administered by the Faculty of a professional school or college, which, for the purpose, acts as a Division of the Graduate Faculty. Degrees are awarded upon recommendation of the Division to

the Graduate Faculty. Because of the separate administration, no further information regarding admission or academic requirements for these degrees is included in this *Announcement*. Inquiries addressed to the Graduate School will be forwarded to the proper official. The following professional degrees are approved by the Graduate Faculty:

Master of Architecture (M.Arch.). Advanced training in architectural design, construction, and research. Only graduates of a five-year professional program in architecture are admitted as candidates. (Professor T. W. Mackesey)

Master of Fine Arts (M.F.A.). Advanced training in the practice of painting or sculpture. (Professor J. A. Hartell)

Master of Landscape Architecture (M.L.A.). Advanced training in landscape design. (Professor F. W. Edmondson)

Master of Regional Planning (M.R.P.). Training for a professional career in the fields of city planning or regional planning. (Professor J. W. Reps)

These degrees are administered by the Division of Architecture and Fine Arts. Inquiries should be addressed to the listed professor.

Master of Laws (LL.M.). This degree is intended primarily for a student who desires to increase his knowledge of the law by working in a specialized field.

Doctor of the Science of Law (J.S.D.). This degree is intended for a student who desires to become a proficient scholar by original investigation into functions, administration, history, and progress of law.

These degrees are administered by the Division of Law.

Master of Education (M.Ed.). This degree is granted upon the satisfactory completion of a program of preparation for professional services in education, such as teaching, administration, student personnel work, and supervision.

Doctor of Education (Ed.D.). The program for this degree is designed to prepare the candidate within a broad cultural context for professional leadership in a selected field of education.

These degrees are administered by the School of Education.

Master of Industrial and Labor Relations (M.I.L.R.). The program leading to this degree provides a basic course of graduate study for those with professional interests in industrial and labor relations and further provides limited opportunities for specialized professional study where broad competence has been established.

This degree is administered by the Division of Industrial and Labor Relations.

NONCANDIDATES

Wherever staff and facilities are available in the University, the Graduate School is an agency for the special training of adults holding a baccalaureate degree or the equivalent. Applicants may be admitted as noncandidates and register for such formal or informal instruction as their preparation warrants. The work of such a noncandidate is under the supervision of an adviser selected by the student and approved by the Dean. He is subject to the general regulations of the Graduate Faculty and of the University.

An applicant for admission as candidate for an advanced degree may be advised by the Admissions Committee to enter as a noncandidate because his record or statement of training and intentions does not clearly indicate his ability to pursue study in candidacy. In such instances the noncandidate may reapply for admission to candidacy after a period of study on campus not exceeding two semesters. If he is admitted into candidacy, a maximum of one residence unit may be transferred to candidacy, providing there is convincing evidence that the student could have satisfied all requirements for admission to candidacy before he began that unit of study.

General Information

CORNELL University regularly publishes a pamphlet, *General Information,* which describes the complete educational program of the University. It will be sent without charge to anyone applying to the Official Publication office, Cornell University. The information given below is that part which particularly relates to graduate students.

TUITION AND FEES*

Tuition and fees will become due when the student registers. The University allows twenty days of grace in each term, five days in the six-week Summer Session. The last day of grace is printed on the registration coupon which the student is required to present at the Treasurer's office. Any student who fails to pay his tuition charges, other fees, and other indebtedness to the University, or who, if entitled to free tuition, fails to claim it at the Treasurer's office and to pay his other fees within the prescribed period of grace, is thereby dropped from the University unless the Treasurer has granted him an extension of time to complete payment. The Treasurer is permitted to grant such an extension when, in his judgment, the circumstances of a particular case warrant his doing so. For any such extension the student is assessed a fee of $2. A reinstatement fee of $5 is assessed against any student who is permitted to continue or return to classes after being dropped from the University for default in payments. The assessment may be waived in any instance for reasons satisfactory to the Treasurer and the Registrar, when such reasons are set forth in a written statement.

Students registering at any time during the last ten weeks of any term are required to pay tuition at the rate of 10 per cent of the regular tuition of the term for each week or fraction of a week between the day of registration and the last examination day of the term. Students registering at any time during the last five weeks in the short summer courses are required to pay tuition at the rate of 20 per cent of the term's tuition for each week or fraction of a week between the day of registration and the last examination day of the term.

A tuition fee or other fee may be changed by the Trustees at any time without previous notice.

FEES PAYABLE BY GRADUATE STUDENTS

REGISTRATION DEPOSIT...A deposit of $28 must be made by every applicant for admission after the applicant has received pro-

*This statement is prepared by the Treasurer, who alone is authorized to interpret it.

visional notice of acceptance, unless the candidate has previously matriculated as a student at Cornell University. This deposit is used to pay the matriculation fee, chest X-ray, and examination blank charge, and covers certain expenses incident to graduation if the student receives a degree.

A TUITION FEE of $150 a term is to be paid by all students registered in the Graduate School with major concentration in subjects within the state-supported colleges of the University; all others must pay a fee of $375 a term. This fee is payable at the beginning of each term.

Upon recommendation by the appropriate college dean and by action of the Board of Trustees, for each appointment in a state-sponsored school or college, waiver of tuition in the Graduate School may be made to a member of the teaching or scientific staff, whose major field of study is in a state-supported school or college, subject to the following limitations:

(a) If the rate of annual salary for the academic year is not greater than $1700, the tuition fee may be waived entirely;

(b) If the rate of annual salary is greater than $1700 but not greater than $1800, 25% of the tuition will be charged and 75% waived;

(c) If the rate of annual salary for the academic year is greater than $1800 but not greater than $1900, 50% of the tuition will be charged and the balance waived;

(d) If the rate of annual salary for the academic year is greater than $1900 but not greater than $2000, 75% of the tuition will be charged and the balance waived;

(e) If the rate of annual salary is greater than $2000, no waiver will be made.

The word salary as used above means total pay, that is, base pay plus any bonus.

Graduate assistants on the nine- or twelve-month basis who reside here during the summer, who are registered for Summer Research for credit in the Graduate School, and who are required to give service in their department or college during that period may be recommended for waiver of tuition during the summer period under the above limitations. This waiver of tuition does not apply if the student registers in the Summer Session. Those who are engaged only in graduate study and not doing productive work for the department during the summer may not have their tuition waived. The amount of tuition to which the above percentages will be applied is the prorated amount of the full tuition fee based upon the maximum amount of residence units that can be earned.

A regularly appointed member of the teaching or scientific staff registered in the Graduate School, whose appointment does not carry free tuition, shall pay tuition at the rate of three-quarters of the tuition regularly charged full-time students, unless arrangements have been made in advance with the Dean of the Graduate School whereby such student is to receive less than three-quarters of full residence credit because of his appointment, in which case the student may apply to the Treasurer for proration of tuition on the basis of the maximum residence credit that may be earned.

Candidates who have completed minimum residence requirements are not eligible for waiver of tuition except within the limits stated above.

A COLLEGE AND UNIVERSITY FEE of $67.50 a term, payable at the beginning of each term, is required of all students registered in the Graduate School. This general fee contributes toward the services supplied by the libraries, Clinic and Infirmary, and the student union in

Willard Straight Hall, and pays a portion of the extra cost of laboratory courses and general administration.

A graduate student who returns to the University to present his thesis and to take the final examination for an advanced degree, all other work for that degree having been previously completed, shall register as a "candidate for degree only" and shall pay only an administration fee of $34.50.

A THESIS FEE of $30 is required at the time of depositing the approved thesis and abstract in final form. This fee covers the cost of preparing a master microfilm of the entire thesis; of publishing the abstract in the bimonthly periodical, *Dissertation Abstracts;* of mailing the thesis and abstract to and from the microfilm publisher; and of binding both copies of the thesis for deposit in the University Library.

REFUNDS of tuition and other fixed fees will be made to students who withdraw from the University, prior to the completion of a term, for reasons accepted as satisfactory. For students who do not complete a term, tuition and other fees will be charged at the rate of 10 per cent for each week, or fraction of a week, from the first day of registration to the date of withdrawal as certified by the College; provided, however, if withdrawal is made within six days of the date of registration, no charge is assessed. The matriculation fee will not be refunded.

FEES FOR THE SUMMER SESSION...Graduate students who attend classes in the Summer Session must register both in the Graduate School and in the Summer Session; they must pay a tuition fee of $90, plus a fee of $15 for services supplied by the Clinic and Infirmary, the student union, and general administration, and also laboratory fees as listed in the *Announcement of the Summer Session.*

MOTOR VEHICLE REGISTRATION AND PARKING FEES... Any student, unless he has the rank of instructor in Cornell University, who owns, maintains, or for his own benefit operates, or has in charge, a motor-driven vehicle in Tompkins County, is required to register his vehicle in person with the Safety Division, and, unless it is owned by another member of his immediate family who is a resident of Tompkins County, to pay a registration fee of $2 a term. He must present (a) written consent of his parent or guardian if he is under 21 years of age, (b) evidence that the vehicle may be legally driven in New York State, (c) evidence that the operator may legally drive in New York State, and (d) evidence that the vehicle is effectively insured against public liability for personal injury and property damage for the standard minima of $10,000–$20,000–$5,000. This registration, which includes obtaining a registration sticker and paying the fee, must be completed within the registration days at the beginning of the first term if the student is then subject to the rule. If he becomes subject to the rule after that

time, he has one week in which to comply with it. Late registration of a vehicle makes the student liable to a fine of $5.

MOTORCYCLES must be registered but may not be used anywhere on the campus during class hours.

STUDENT PARKING on the campus during University hours is *prohibited.* Exemption may be granted by the Safety Division when the use of the car is essential to the student's attending classes or carrying on his academic or departmental work.

During the Summer Session, the rules are the same.

The student's registration in the University is held to constitute an agreement on his part that he will abide by its rules and regulations with regard to traffic and parking or suffer the penalty prescribed for any violation of them. All privileges here indicated may be denied a student who is not in good standing.

SUMMER RESEARCH...Students carrying on Summer Research are required to register with the Registrar as well as in the Graduate School.

Students registered for Summer Research, if they desire residence units for their work, must pay a tuition fee proportionate to the unit period in regular terms. Such students must pay the College and University general fee of $33.75 if the period is eight weeks, or $67.50 if the period is twelve weeks. Such payment admits the student to the current Summer Session classes without additional tuition payments, provided that the tuition paid is at least equal to that charged students registered in the Summer Session. Students registered for Summer Research during the summer, not for units, are exempt from the payment of tuition, but may not attend, either as visitors or for subsequent credit, any of the classes or exercises of the Summer Session.

FELLOWSHIPS, SCHOLARSHIPS, PRIZES, LOANS

FELLOWSHIPS AND SCHOLARSHIPS...Those who hold fellowships and scholarships pursue a full-time course of study and are not required to render services to the University. The holder of a fellowship may not accept any other appointment. The holder of a scholarship may, on approval of the Fellowship Board, accept another appointment. Fellowships and scholarships are gifts and are free from income tax.

The stipends of fellowships and scholarships are payable at the office of the Treasurer of the University in eight or twelve equal installments, at the option of the holder, with the first payment due October 10 and the other payments due on the tenth of each succeeding month.

Applications for fellowships or scholarships are made to the Graduate School, 125 Edmund Ezra Day Hall, Cornell University, on forms obtained from that office. The applicant either must be a matriculated

student in the Graduate School or must have filed an application for admission, with necessary credentials, within the previous 18 months. Filing application for admission does not obligate the applicant.

Under the rules of the Association of Graduate Schools, the regular time for notification of award of fellowships and scholarships for an academic year is April 1. *All fellowship and scholarship applications received by February 20 will be considered for April 1 award, and on that day each applicant will be notified as to whether he has or has not been appointed or named as an alternate for a fellowship or scholarship.* The applicant is allowed until April 15 to notify the Graduate School whether or not he will accept the award. Applications received after February 20 may be considered at a later date if vacancies occur due to withdrawal of principals and alternates or for other reasons. Fellowships and scholarships are usually granted for an academic year, but under some conditions may be awarded for a single semester or for a Summer Research period.

The fellowships and scholarships available for 1954–55 and 1955–56 are listed below.* The total value of the fellowship or scholarship is indicated in each case. Tuition for students whose major work is in Fields of the endowed institutions is $750†, and for students whose major work is in Fields of the state institutions, it is $300. In addition to the fellowships and scholarships listed below, a reference list of those available outside the University is maintained at the Graduate Office.

FELLOWSHIPS AND SCHOLARSHIPS OPEN TO CANDIDATES IN ALL FIELDS

Cornell University Senior Graduate Fellowships (four) $2100–$2500
Stipend $1800, tuition $300 or $700. For candidates near the completion of study for the doctorate or in exceptional instances for postdoctoral study. A travel allowance may be granted in place of tuition.

Cornell University Junior Graduate Fellowships (eighteen) $1520–$1920
Stipend $1100, tuition and fees $420 or $820 — for new or matriculated students

Allen Seymour Olmsted Fellowships (two) $1400–$1800
Stipend $1100, tuition $300 or $700 — for new or matriculated students

Glasgow University Exchange Fellowship
Tuition, board, room, and an allowance of $380 for travel — limited to matriculated students for one year of study at Glasgow University

Tuition Scholarships (thirty) $300–$700
For new or matriculated students. A statement of financial need is required.

Phi Kappa Phi Scholarship $200

Travel Grant $300
Possibly available for *University Fellowships.*

*The Special Temporary Fellowships are marked with an asterisk, and their listing is based on their availability in 1953–54.

†Because of the recent increase in tuition and fees by the Board of Trustees, effective at the close of the spring term, 1954, in the list below read $750 for $700; $435 for $420; $885 for $820.

HUMANITIES

ARCHITECTURE

University Fellowship $1100
Stipend $400, tuition $700 — open to candidates in Fields of Architecture, Landscape Architecture, Fine Arts, and City and Regional Planning

CLASSICS

University Fellowship $1500
Stipend $800, tuition $700
University Scholarships (two) $900
Stipend $200, tuition $700

ENGLISH LANGUAGE AND LITERATURE

Martin Sampson Teaching Fellowship $1850
Stipend $1150, tuition $700. Incumbent teaches one class in English.

PHILOSOPHY

Susan Linn Sage Fellowships (two) $1600
Stipend $900, tuition $700

ROMANCE STUDIES

University Fellowship $1500
Stipend $800, tuition $700 — not available in 1955–56

SOCIAL SCIENCES

Social Science Research Center Fellowships (six) $2300–$3100
Stipend $1600–$2400, tuition or travel $700 — open to candidates in the social sciences who are concentrating in problems of human behavior; normally reserved for candidates near completion of the doctorate. Apply to Director, Social Science Research Center, Cornell University.

Southeast Asia Training Fellowships (eight) $820–$1820
Stipend $1000, tuition and fees $820 — open to candidates participating in the Southeast Asia Program. Apply to Director, Southeast Asia Program, Morrill Hall.

Anna Cora Smith Fellowship in Home Economis $700
Stipend $400, tuition $300 — open to all candidates in Home Economics Fields

Henry Strong Denison Fellowship in Agriulture $1300
See BIOLOGICAL SCIENCES

Clinton DeWitt Smith Fellowship in Agriculture $1100
See BIOLOGICAL SCIENCES

ANTHROPOLOGY

Cornell Sigma Xi Fellowship $1300–$1700
Stipend $1000, tuition $300 or $700 — also open to candidates in the Groups of BIOLOGICAL SCIENCES and PHYSICAL SCIENCES. Not available in 1955–56.

BUSINESS AND PUBLIC ADMINISTRATION

A number of fellowships and scholarships are available each year for candidates for the Ph.D. degree, ranging in stipend from $500 to $3,000

CHILD DEVELOPMENT AND FAMILY RELATIONSHIPS

**Grant Foundation Fellowships in Family Life Education* (two or three) $1400–$3000
Stipend $1400–$3000. Tuition is not included.

ECONOMICS

President White Fellowship $1700
Stipend $1000, tuition $700

EDUCATION AND RURAL EDUCATION

Education Fellowships for Elementary Teachers (fifteen) $1800
Stipend $980, tuition and fees $820. For graduates of liberal arts Colleges without professional training or teaching experience who wish to study for the M.Ed. degree. Apply to Professor Claude L. Kulp, Barnes Hall.

Comstock Scholarship in Nature Study $450–$600
Stipend $300 for 1954–55, $150 for 1955–56, tuition $300

FAR EASTERN STUDIES

India Training Fellowships (two) $1820
Stipend $1000, tuition and fees $820

HISTORY

President White Fellowship $1800
Stipend $1100, tuition $700

George C. Boldt Fellowship $1700
Stipend $1000, tuition $700

Gertrude A. Gillmore Research Fellowship $1500
Stipend $1500. Does not include tuition. Open to women students who are ordinarily in their last year of work for the doctorate.

INDUSTRIAL AND LABOR RELATIONS

Tuition Scholarships (four) $300

BIOLOGICAL SCIENCES

Cornell Sigma Xi Fellowship $1300–$1700
Stipend $1000, tuition $300 or $700 — open to candidates in Anthropology, Biological Sciences and Physical Sciences. Not available in 1955–56.

Henry Strong Denison Fellowships in Agriculture (three) $1300
Stipend $1000, tuition $300 — open to candidates in plant sciences, animal sciences and social sciences (Agricultural Engineering, Agricultural Economics, Rural Education, and Rural Sociology). Preference will be given to those applicants who expect to complete the requirements for the doctorate and who appear most promising from the standpoint of ability to conduct research.

Clinton DeWitt Smith Fellowship in Agriculture $1100
Stipend $800, tuition $300 — open to students who come from farm homes and who have had farm training. Not available in 1955–56.

Simon Henry Gage Fellowship in Animal Biology $1500–$1900
Stipend $1200, tuition $300 or $700 — open to candidates in the Fields of Biochemistry, Conservation, Entomology, and Zoology. Available only in 1955–56.

Schyler Fellowship in Animal Biology $1500–$1900
Stipend $1200, tuition $300 or $700 — open to candidates in Biochemistry, Conservation, Entomology, and Zoology. Available only in 1954–55.

**Shell Fellowship in Plant Science* $1920
Stipend $1500, tuition and fees $420

**Allied Chemical & Dye Fellowship in Entomology or Plant Pathology* $1920–$2420
Stipend $1500 (single), $2000 (married); tuition and fees $420 if not covered by G. I. Benefits

ANIMAL HUSBANDRY

The Morrison Fellowship in Livestock Feeding $1300
Stipend $1000, tuition $300

ENTOMOLOGY

Comstock Scholarship in Entomology $300–$450
Stipend $150 (not available in 1954–55), tuition $300

PSYCHOLOGY

Dallenbach Fellowship $1500
Stipend $800, tuition $700 — not available in 1955–56
Susan Linn Sage Fellowship $1500–$1900
Stipend $800–$1200, tuition $700 — not available in 1955–56

PHYSICAL SCIENCES

Cornell Sigma Xi Fellowship $1300–$1700
Stipend $1000, tuition $300 or $700 — open to candidates in Anthropology, Biological Sciences, and Physical Sciences. Not available in 1955–56.

John McMullen Graduate Scholarships (ten) $1800
Tuition not included; open to all Fields of Engineering. Apply to the Dean, College of Engineering, Cornell University.

Hannibal Ford Fellowship $3320
Stipend $2500, tuition and fees $820. Available to students who are American citizens in their first year of graduate study, or to those who have completed no more than a limited amount of auxiliary study at the graduate level in Electrical or Mechanical Engineering, Engineering Physics, or Mechanics and Materials.

AERONAUTICAL ENGINEERING

**Avco Manufacturing Corporation Fellowship* $2320
Stipend $1500, tuition and fees $820
**Curtiss-Wright Fellowship* $2320
Stipend $1500, tuition and fees $820
**Fairchild Engine & Aeroplane Corporation Fellowship* $2320
Stipend $1500, tuition and fees $820
**Grumman Corporation Fellowship* $2320
Stipend $1500, tuition and fees $820

CHEMICAL ENGINEERING

**DuPont Company Postgraduate Fellowship* $2320–$2920
Stipend $1500 (single); $2100 (married), tuition and fees $820
**Ethyl Corporation Fellowship* $2020
Stipend $1200, tuition and fees $820
**Standard Oil of Indiana Fellowship* $2020–$2320
Stipend $1200 (single); $1500 (married), tuition and fees $820
**Texas Company Fellowship* $2000
Stipend $1180, tuition and fees $820
**Visking Corporation Fellowship* $2320
Stipend $1500, tuition and fees $820

CHEMISTRY

Sage Fellowships for Summer Research (three) $425
Stipend $250, tuition $187.50
Carl G. Schluederberg Fellowships for Summer Research (five) $425
Stipend $250, tuition $187.50

John E. Teeple Fellowships for Summer Research (four) $425
Stipend $250, tuition $187.50
**Allied Chemical and Dye Fellowship* $2320–$2820
Stipend $1500 (single); $2000 (married), tuition and fees $820
**General Electric Fellowship* $2220–$2920
Stipend $1400 (single); $2100 (married), tuition and fees $820
**Procter and Gamble Fellowship* $2220–$2920
Stipend $1400 (single); $2100 (married), tuition and fees $820
**Shell Fellowship* $2320
Stipend $1500, tuition and fees $820
**U.S. Rubber Fellowship* $2220–$2920
Stipend $1400 (single); $2100 (married), tuition and fees $820

CIVIL ENGINEERING†

McGraw Fellowship $1100
Stipend $400, tuition $700
University Scholarship $900
Stipend $200, tuition $700
Elon Huntington Hooker Fellowship in Hydraulics $1200
Stipend $500, tuition $700

ELECTRICAL ENGINEERING

Charles Bull Earle Memorial Fellowship $1100
Stipend $400, tuition $700
**Bell Aircraft Corporation Fellowship* $2320
Stipend $1500, tuition and fees $820
**General Electric Scholarship* $1320
Stipend $500, tuition and fees $820
**Republic Aviation Corporation Fellowship* $2320
Stipend $1500, tuition and fees $820
**Sylvania Electric Products Graduate Scholarship* $1320
Stipend $500, tuition and fees $820

ENGINEERING PHYSICS

**Celanese Fellowship* $2620
Stipend $1800, tuition and fees $820
**Radio Corporation of America Fellowship* $2420–$2720
Stipend $1600 (single); $1900 (married), tuition and fees $820

GEOLOGY AND GEOGRAPHY

Eleanor Tatum Long Fellowship $1700
Stipend $1000, tuition $700

MATHEMATICS

Erastus Brooks Fellowship $1500–$1900
Stipend $800–$1200, tuition $700

MECHANICAL ENGINEERING

Edgar J. Myer Fellowship $1100
Stipend $400, tuition $700
**Procter and Gamble Fellowship* $2220–$2920
Stipend $1400 (single); $2100 (married), tuition and fees $820

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†Each of the stipends in C.E. is augmented by McMullen Scholarship funds to make a stipend of $1000.

Sibley Fellowship $1100
Stipend $400, tuition $700

**Westinghouse Educational Foundation Fellowship* $2000
Stipend $1200, tuition and fees up to $800

METALLURGICAL ENGINEERING

**International Nickel Company Fellowship* $2320
Stipend $1500, tuition and fees $820

PHYSICS

**Corning Glass Predoctoral or Postdoctoral Fellowship* $2620–$4000
Stipend $1000, tuition and fees $820, for predoctoral; stipend $4000 for postdoctoral, no tuition or fees required

**Eastman Kodak Company Fellowship* $2220
Stipend $1400, tuition and fees $820 if not provided by G.I. Benefits — open only to candidates in their final year of study for the Ph.D.

**General Electric Fellowship* $2220–$2920
Stipend $1400 (single); $2100 (married), tuition and fees $820

PRIZES

Seven University prizes are open for competition to all students, including graduate students; the Committee on Prizes of the University Faculty publishes a descriptive list, which may be obtained from the Official Publication office, Edmund Ezra Day Hall.

Two other prizes are open exclusively to graduate students:

THE GUILFORD ESSAY PRIZE...Until at least 1962, a special scholarship of $120 will be assigned annually to that graduate student who, in the judgment of the Graduate Faculty, writes the best English prose. Each competitor must submit, at or before 12 o'clock of the last Monday in November, specimens of his English prose of in all not less than fifteen hundred words, preferably prepared as a normal part of his training in candidacy for an advanced degree.

THE PHILOSOPHY PRIZE...A prize of $50 is awarded to the graduate student who submits the best paper embodying the results of research in the field of philosophy. The subject of the paper may be historical or critical or constructive. It may be concerned either with problems of pure philosophy or with the philosophical bearing of the concepts and methods of the sciences. Papers must be submitted on or before the first day of May.

Papers submitted in competition for either prize must be typewritten, double-spaced, and signed with an assumed name, the real name of the competitor being enclosed in a sealed envelope, superscribed with the assumed name. They are to be deposited in the office of the Graduate School.

LOANS

Contributions from the alumni of Cornell University have made possible the establishment of a Graduate Student Loan Fund for use of graduate students already enrolled in Cornell University in case of financial emergency. Usually a term of successful residence is required before loans are granted. Applications should be made to the office of the Dean of Men and Dean of Women.

ASSISTANTSHIPS AND OTHER EMPLOYMENT

ASSISTANTSHIPS

The colleges, schools, and departments of the University regularly contract for the assistance of graduate students in teaching, research, and administration. The contracting parties and the Faculty of the Graduate School see that appointments and assignment of duties are made with proper consideration for the candidate's graduate program. Usually the duties of the assistant lie in the field of his major interest and contribute to his intellectual and technical proficiency in the field. Assistants are eligible for residence units in candidacy for advanced degrees according to regulations of the Graduate Faculty. Normally an assistant who is called upon for services not exceeding twenty clock-hours a week is eligible for three-fourths of a unit each term, but by earning an additional one-half unit in subsequent Summer Research, he may earn two units in one calendar year. Those desiring appointment should apply to the head of the department concerned. Applications mistakenly addressed to the Graduate School are forwarded to the proper department.

STUDENT DEANS

Graduate students who are assistants in student personnel work are known as Student Deans. Student Deans have residence duties as laboratory experience and work on special projects of similar nature. They major in guidance and personnel administration or related fields. Appointees receive room and board plus an honorarium. The honorarium may range from $50 to $470 a year, depending upon the program plans of the individual student. Applications should be addressed to Professor Isabel Peard, Edmund Ezra Day Hall.

OTHER EMPLOYMENT

A part-time student employment service is maintained by the University in the office of the Dean of Men and Dean of Women, Edmund Ezra Day Hall. Additional opportunities for part-time work are often available in connection with departmental research projects or other activities. Applications for this type of work should be made directly with the department concerned. If a candidate is employed on research projects and work closely allied to his academic interests, he may find such employment valuable. Progress in candidacy, however, is difficult when a student attempts to support himself wholly or partially by work unrelated to his field. It is usually sounder economy to borrow some money and keep employment to a minimum.

LIVING FACILITIES

It is the responsibility of each graduate student to arrange for his own living quarters. Any time after January first, he should write to the Department of Residential Halls, Edmund Ezra Day Hall, for current information on both University and off-campus housing for the coming year.

Although the University does not normally operate separate housing units for graduate women, it has occasionally been possible in the past to divert one or more small cottages from undergraduate use for this purpose. Housing plans for 1954–55 do not include operation of a graduate cottage; any deviation from the present schedule would be announced in July or August. On approval of application to the Dean of Women, Edmund Ezra Day Hall, graduate women under 21 years of age will be considered for assignment to undergraduate space. Such assignments entail room, board, and an allowance for personal laundry at regular undergraduate rates. Assignments are made only after all undergraduate placement is completed in September.

The University does not operate separate housing units for graduate men. Upon application, they may be assigned to space, when available, within the men's undergraduate dormitories.

Facilities for married students include privately operated accommodations in Ithaca and surrounding area, and the temporary housing projects under University supervision which provide approximately 150 apartments for married veterans. Married veterans interested in temporary housing projects should apply to the Veterans' Housing Office, Edmund Ezra Day Hall, Cornell University, Ithaca. Other married students and those veterans who are on the waiting list for assignment to the housing projects should come to Ithaca well in advance of the beginning of the term and make their own arrangements.

The Department of Residential Halls maintains an Off-Campus Housing Office which serves as an information center for privately operated accommodations. Off-campus rooms range in price from $5 to $10 a week, the average being $6 to $7. It is rarely possible to arrange for room, board, and laundry at the same place off campus. There are, however, several restaurants and cafeterias on or near the campus which serve off-campus and University-housed students alike. The present estimated cost of board is $2.25 to $2.75 a day.

HEALTH SERVICES AND MEDICAL CARE

These services are centered in the University Clinic (out-patient department) and in the Cornell Infirmary (hospital). Students are entitled to unlimited visits at the Clinic; laboratory and X-ray examinations indicated for diagnosis and treatment; hospitalization in the Infirmary with medical care for a maximum of fourteen days each

term and emergency surgical care. (Surgery for the correction of chronic remediable defects and obstetrical services are not included.) The cost for these services is included in the College and University general fee.*

The following health requirements for entering graduate students have been adopted by the Board of Trustees of Cornell University. The Board has also ruled that failure to fulfill these requirements will result in a recommendation to the Registrar that the student be denied the privilege of registering the following term.

(1) *VACCINATION AGAINST SMALLPOX*...A satisfactory certificate of vaccination against smallpox must be filed at the Graduate School office before registration. It will be accepted as satisfactory only if it certifies that within the last five years a successful vaccination has been performed or three unsuccessful vaccination attempts have been made.

(2) *HEALTH HISTORY*...Students accepted for admission will be required to fill out Cornell student health record forms.

(3) *CHEST X-RAY FILM FOR PERMANENT FILE AT THE INFIRMARY*...This chest film may be made by a private physician within a month of entrance and presented to the Clinical Director at the time of registration; otherwise, a chest radiograph will be made during the orientation period or registration week. A charge of $2 for making this radiograph is included in the matriculation fee. When a student has been away from the University for any reason for a year or more, he must have another X-ray upon re-entrance, for which he will be billed.

COUNSELING AND PLACEMENT

The University maintains a variety of counseling services of the type needed by graduate students. The primary counselors are the members of the Special Committee. The Dean of the Graduate School will direct graduate students to other available services, including such agencies as the Deans of Men and Women, the University Testing Service, Cornell United Religious Work, and military and ROTC advisers.

The University Placement Service makes arrangements for interviews on and off campus with employers, supervises the assembling and presentation of personnel records, and assists Cornell men and women who are ready for positions in business and industry. The Educational Placement Service performs a similar function for those whose vocation is teaching. Many of the professional schools and colleges maintain separate placement offices for the special professions; their services are available to registered graduate students and alumni.

*A charge ($3 in the daytime and $5 at night) is made for house calls.

FOREIGN STUDENTS

Applications and all necessary credentials for admission should be filed by foreign students several months before registration day. No student should apply who has not mastered colloquial English.

Before applying, a student from another country should be certain that he has sufficient available funds in dollars to meet all necessary expenses. Because of his unfamiliarity with local patterns of living and buying, he will need to calculate a somewhat higher amount for board, room, and travel than the amounts cited in this *Announcement* and elsewhere. He should, too, make arrangements for additional help in the event of protracted illness or other emergency. Students from foreign countries whose native language is not English or whose preparation differs from that of citizens of the United States should not expect to receive their degrees at the end of the minimum residence period. Moreover, agencies subsidizing such students should be prepared to support them for a longer period. Such students are usually unable to qualify for assistantships or for other appointments yielding financial assistance.

Within these limits, Cornell University welcomes students from other countries. In 1952–53, there were 471 students from 72 foreign countries registered in the University. The University maintains on its staff a Counselor to Foreign Students, Donald C. Kerr, whose duty is to look after the welfare of all students from other countries. He may be consulted on personal problems, social questions, or any other matter in which he may be helpful. His office is in Edmund Ezra Day Hall, Room 144. All foreign students should write him before coming to Ithaca or call on him immediately upon arrival.

ORGANIZATIONS FOR GRADUATE STUDENTS

There are places for graduate students in some extracurricular activities shared by undergraduates, such as intramural sports, drama, publications, music, and the other arts. In the main, however, by reason of maturity and different interests, graduate students have their own organizations. More than twenty-five such organizations center in academic Fields or groups of Fields; some are purely social, others informally academic. As an instance, one club founded in 1907, made up of over one hundred faculty and graduate student members interested in plant breeding and genetics, meets bimonthly for a dinner prepared by its members, after which the members hold an hour's discussion on some topic outside those Fields, led by an invited visitor. Gamma Alpha is the only graduate fraternity which operates its own house, with facilities for both room and board; its membership is limited to students of physical and natural science – broadly interpreted. Other fraternities and sororities limited to graduate students and Faculty are in

some instances social, in others academic or honorary. There are general organizations interested in politics, home life, art, etc. The graduate wives' club thrives; in addition to regular meetings for its more than one hundred members, interest groups meet separately.

WILLARD STRAIGHT HALL is the center of social life, both graduate and undergraduate. Supported by University fees included in the tuition and fees listed above, it supplies facilities for graduate groups and plans special functions for them. There is a graduate representative on the Board of Managers.

SAGE CHAPEL, where nonsectarian services each Sunday are led by distinguished guest speakers, is maintained by the University. Graduate students are eligible for its trained choir.

Cornell's location in the Finger Lakes region of New York State stimulates outdoor activity. Agencies of the University operate an outdoor swimming pool, a golf course, a ski run with ski tow (twelve miles from the campus), riding classes, and other outdoor facilities. There are three large state parks within ten miles of the campus. Departments of the University plan field trips for various purposes, including ornithological, geological, agricultural, and industrial, which are open to interested graduate students.

RESOURCES FOR RESEARCH AND ADVANCED STUDY

The Graduate School does not conduct programs leading to advanced degrees in fields inadequately equipped for the purposes. Substantial collections and apparatus, in many instances unique, have been assembled for the use of graduate students; they are not described in this *Announcement.* The student allotment is designed to prevent emasculation of the pattern of individual instruction.

The descriptions below are limited to major general facilities at the service of graduate students in any or a variety of Fields of Instruction.

OFFICE OF VICE PRESIDENT FOR RESEARCH

Established to aid members of the Faculty in arranging for outside sponsorship, chiefly by industry, government, and foundations, of cooperative research programs of interest and concern to Faculty and their students, this office advised and assisted in administering research projects in the University to the amount of almost eighteen million dollars during 1952–53. All phases of human endeavor were represented, ranging from 47.4 per cent in aeronautics (the work of the Cornell Aeronautical Laboratory at Buffalo) and 25.0 per cent in agriculture to 0.6 per cent in the humanities. In addition to these projects aided by outside sponsors, there is a large amount of unsponsored

research by departments and individual staff members supported by the University itself as a continuing part of the normal professional activity of its members. The office of the Vice President for Research works closely with the Graduate Faculty in supporting research programs which properly advance the education and training of graduate students, especially with reference to industrially sponsored fellowships.

RESEARCH CENTERS

THE SOCIAL SCIENCE RESEARCH CENTER. . . is an organization designed to encourage and facilitate research in all major fields of the social sciences. Its services and facilities are available for social science research by individual Faculty members and graduate students in all schools and colleges of the University, as well as for use by organized staff groups. In addition to aid in the planning and development of studies and in voluntary cooperation of research workers, the Center supplies technical services by appropriate arrangement with the directors and staffs of specific projects. The two main objectives of the organization are to encourage basic research advances by means of technical and financial aids and to provide practical research training.

Projects currently sponsored or assisted by the Center deal with problems of interest to each social science discipline. A major theme of the present research program is the study of social change and of the impact of technology and economic change upon modern societies, both in the United States and in several foreign areas.

A number of opportunities for training through participation in studies sponsored by the Center are available to graduate students who qualify for research assistantships or special employment arrangements. Normally each study provides one or more opportunities of this kind. Students participating in Center research register in the Graduate School and select major and minor subjects in accordance with the established procedures of the Graduate School. Arrangements for such research experience are made through the student's Special Committee in consultation with the directors of specific studies.

The Director of the Center is Professor Robin M. Williams, Jr. Morrill Hall.

STATISTICS CENTER. . . The methods of statistics find important applications in many diverse fields of research. It is therefore necessary that (1) subject matter specialists be able to obtain assistance in using or developing statistical theory, (2) students who intend to do research in a particular field which makes extensive use of statistical methods receive adequate training in statistics, and (3) individuals be trained as statisticians.

The staff members of the various schools and colleges of Cornell University who are interested in the development and application of sta-

tistical methods are associated in the Cornell Statistics Center. A major responsibility of the Center is to provide a focal point to which individuals, projects, and departments may come to receive assistance and guidance with respect to the statistical aspects of research and training programs.

The Acting Director of the Center is Professor Philip J. McCarthy, Warren Hall.

HOUSING RESEARCH CENTER...The purpose of the Housing Research Center is to aid and guide basic research in the field of housing, to facilitate graduate study, and to route housing information among colleges and departments and between the University and sources of information off campus. A small central staff facilitates the initiation and conduct of projects.

The facilities of the Housing Research Center are available to Faculty members and graduate students in all Fields. Through the Center, students who cut across traditional lines of research may draw upon the knowledge and experience of specialists in such various subject areas as design, materials, equipment, structural methods, environment, family living, economics and finance, government, and health.

The Director of the Center is Professor Glenn H. Beyer, Martha Van Rensselaer Hall Annex.

CENTER FOR AERIAL PHOTOGRAPHIC STUDIES...Photographic interpretation has applications in the fields of agriculture, engineering, geology, and city and regional planning. The Center for Aerial Photographic Studies offers a broad program in various scientific fields for training personnel in aerial photographic interpretation. The objectives are, first, to train scientists who will be able to use aerial photographs for surveys and planning in fields where they are needed and, second, through research to extend the use of aerial photographs into all fields which can be benefited.

The Center comprises a staff of educators, scientists, and technicians experienced in research and the application of aerial photographs to their respective fields. The program consists of primary courses in engineering interpretation of aerial photographs, map reproduction, photogrammetry, cartography and map projections, together with specialized study in a particular field of the candidate's choice, such as agricultural development, national resource explorations, city planning, or engineering project planning.

For information about the Center, write to the Director, Center for Aerial Photographic Studies, Lincoln Hall.

NEW YORK STATE AGRICULTURAL EXPERIMENT STATION AT GENEVA...Since July 1, 1923, the New York State Agricultural Experiment Station at Geneva has been under the administration of Cornell University. Research workers on its staff are eligible for mem-

bership on the Faculty of the Graduate School, and its facilities for research are available to graduate students.

The Station is equipped to care for graduate students in certain specific lines of research, viz., bacteriology, chemistry, economic entomology, plant pathology, pomology, seed investigations, and vegetable crops. Ample accommodations are available from the standpoint of laboratory facilities, reference library, etc., for research in the laboratory sciences. Greenhouses and a farm of approximately 500 acres are available for work with fruits and vegetables.

Certain phases of the investigations now being conducted at the Station and other problems for which the facilities of the Station are suitable may be used as thesis problems by graduate students.

The Director is Professor A. J. Heinicke, Plant Science Building, Cornell University, Ithaca.

Students who plan to do part of their graduate work at Geneva should correspond with their major adviser or with the Dean of the Graduate School concerning regulations as to residence, Special Committees, etc.

THE CORNELL AERONAUTICAL LABORATORY, a separate corporation wholly owned by Cornell University, is in Buffalo, New York. Applied and fundamental research in the aeronautical sciences is conducted in this very completely equipped laboratory under contracts with the Military Services. Quite close relationships, both research and educational, are maintained with the campus in Ithaca.

OTHER RESEARCH UNITS. . .Some other research units allied with the University, either as wholly owned and operated divisions or as wholly or partially autonomous organizations with which the University has a working agreement, are the Sloan-Kettering Cancer Research Institute (in New York City, through the Graduate School of Medical Sciences), the Veterinary Virus Research Institute (at Ithaca), and the Brookhaven National Laboratory (Cornell is one of nine university trustees, under contract with the Atomic Energy Commission).

THE UNIVERSITY LIBRARIES

The University libraries comprise the General Library, Departmental and Seminary Libraries, the Libraries of the Colleges of Agriculture, Engineering, Home Economics, Industrial and Labor Relations, Law, Medicine, and Veterinary Medicine, and special libraries like the Anabel Taylor Library (religion), the Goldwin Smith Library (humanities), and the Library of the Cornell Aeronautical Laboratory. The total current holdings are about a million and a half items. There are also over four million separate manuscript items in the Regional History Collection. The most recent addition to the physical facilities is the Albert R. Mann Library of Agriculture and Home Economics.

Cubicles and other study spaces are available for the use of graduate students in the several libraries.

Especially enriched by the early acquisitions of Cornell's first president, Andrew D. White, and by the first librarian, Willard Fiske, the libraries possess special collections of rare books and manuscripts in many of the Fields of graduate study, including unique collections relating to the French Revolution, witchcraft, Dante, Petrarch, China and the orient (Wason), Iceland, American historical documents (Noyes), Brazil, and German literature and philology (Zarncke). A separate rare-book section with a special curatorship has just been established. The acquisitions staffs work with graduate students to procure volumes needed for their special studies.

PUBLICATION AND PHOTOGRAPHY

Cornell University Press is the oldest university press in America and is among the leaders in number of volumes published annually. In addition to serving scholars and scientists of the University by publication of results of studies, the staff of the Press, in cooperation with the Graduate School, conducts colloquia on methods and problems of publishing, directed specifically to graduate students. The Press publishes series of scholarly monographs in certain Fields.

The extension services of the New York State Colleges, which form integral parts of the University, disseminate knowledge through an intensive program of publication, photography, and recording, supervised by professional staffs. Materials of graduate students may find an outlet through these channels.

The University owns and operates the Photographic Science Laboratory, which is equipped to create or cooperate in the creation of photographic studies and visual aids of all kinds.

FACILITIES FOR VISITING FELLOWS

Whenever possible, the Faculty welcomes mature scholars who wish to use the facilities of the University to prosecute investigations or to work with the Faculty in the advancement of knowledge. A scientist or scholar who wishes to work on the campus may, upon recommendation of the department in which he wishes to work and endorsement of the College Dean over that department, be given the title of Visiting Fellow by the President, providing he has no formal duties to perform and is paid no salary by the University.

Fields of Instruction

THE FIELDS of Instruction in the Graduate School are listed alphabetically below under the following four Groups: Humanities, Social Sciences, Biological Sciences, and Physical Sciences. For each of the Fields there are listed the respective faculties, approved major and minor subjects, language requirements for the Master's degree (if any), and special requirements or policies of the Field.

FIELDS. . . In most instances the Field coincides with a department in a college or school. In parentheses immediately following the name of the Field is given an abbreviation indicating the *Announcement* of a school or college which contains descriptions of courses and seminars offered, as follows: *Ag.,* New York State College of Agriculture; *Arch.,* College of Architecture; *Arts,* College of Arts and Sciences; *Ed.,* School of Education; *Engin.,* College of Engineering; *H.E.,* New York State College of Home Economics; *Hotel,* School of Hotel Administration; *I.L.R.,* New York State School of Industrial and Labor Relations; *Vet.,* New York State Veterinary College. For registration and preregistration of courses, see p. 14.

MAJOR AND MINOR SUBJECTS. . . For each Field there is given an approved list of titles from which candidates for advanced general degrees choose major and minor subjects. The numbers 1, 2, 3, 4, 5 have the following meaning:

1, approved as major subject for the Ph.D.

2, approved as major subject for the Master's degree.

3, approved as minor subject when the major is in the same Field.

4, approved as minor subject when the major is in another Field.

5, approved as a minor subject for the Master's degree only.

For explanation regarding *language requirements* for the Master's degree, see p. 12.

REPRESENTATIVES. . . Since instruction in the Graduate School is primarily individual, those interested in becoming students are encouraged to communicate with individual members of the Faculty with whom they may want to study. Personal interviews in advance of formal application for admission are especially encouraged. For the benefit of those who are not acquainted with appropriate members in the Field or Fields of their choice, each Field has selected a Representative to whom inquiries may be addressed. The Representatives are designated in the lists of Faculty below by *italics.*

Humanities

HISTORY OF ART AND ARCHAEOLOGY *(ARTS)*

Professors D. L. Finlayson, N. A. Pattillo, *F. O. Waagé.*

APPROVED MAJOR AND MINOR SUBJECTS

Archaeology 2, 3, 4 History of Art 2, 3, 4

Language requirement for Master's degree, proficiency in one: French, German, Italian.

Graduate work is offered in the general field of the history of the visual arts (architecture, painting, sculpture, and the minor arts). To elect this as a major subject the candidate must present undergraduate preparation comparable to the major course in fine arts, option 2 (visual arts course) in the College of Arts and Sciences at Cornell. Instruction is offered through advanced undergraduate courses and through independent study and research under individual direction.

The same conditions will usually apply in the election of work in the general field of archaeology as a major subject; however, in undergraduate preparation, relevant courses in such subjects as cultural anthropology may be substituted for some of those in art history, and for graduate work in classical archaeology courses in Latin and Greek may be so substituted.

CITY AND REGIONAL PLANNING *(ARCH.)*

Professors F. W. Edmondson, *T. W. Mackesey,* J. W. Reps.

APPROVED MAJOR AND MINOR SUBJECTS

City Planning 1, 3, 4 Regional Planning 1, 3, 4

Major study for candidates for the degree of Ph.D. is limited to those who hold the degree of Master of Regional Planning or its equivalent.

THE CLASSICS *(ARTS)*

Professors Harry Caplan, *James Hutton,* G. M. Kirkwood, Friedrich Solmsen, F. O. Waage.

APPROVED MAJOR AND MINOR SUBJECTS

Latin 1, 2, 3, 4
Medieval and Renaissance Latin Literature 1, 2, 3, 4
Ancient History (see p. 48)
Comparative Indo-European Linguistics 3, 4
Greek 1, 2, 3, 4
Classical Archaeology 2, 3, 4
Classical Rhetoric in original or translation 3, 4
Ancient Thought 3, 4

Language requirement for Master's degree, proficiency in one: French, German.

Admission to graduate study in a subject included in the field of the classics, except in archaeology, assumes a knowledge of the field selected equivalent in general to that expected of a student who has pursued the subject concerned throughout four years of undergraduate study in a college of recognized standing.

Graduate work in the classics is conducted in the main by the seminar system,

the object of which is training in the methods, the principles, and the performance of independent research and criticism, and the work is therefore as far as possible put into the hands of the students themselves. Subjects additional to those investigated in the seminar courses are ordinarily treated in courses of lectures. A seminar room in the University Library building is reserved for the exclusive use of graduate students in the classics.

For fellowships in Greek and Latin, see page 23. The income of the Charles Edwin Bennett Fund for Research in the Classical Languages is used each year in the way best suited to promote the object for which the fund was established.

Doctoral dissertations of an appropriate nature will be accepted for publication in the *Cornell Studies in Classical Philology*.

ENGLISH LANGUAGE AND LITERATURE *(ARTS)*

Profesors M. H. Abrams, R. M. Adams, J. W. Bicknell, G. F. Cronkhite, R. H. Elias, *W. H. French,* B. Hathaway, G. H. Healey, C. W. Jones, W. R. Keast, J. G. Linn, F. E. Mineka, A. M. Mizener, H. A. Myers, D. Novarr, E. B. Partridge, W. M. Sale, R. J. Schoeck, H. W. Thompson, P. M. Zall.

APPROVED MAJOR AND MINOR SUBJECTS

Medieval Literature 1, 2, 3, 4
Old and Middle English 1, 2, 3, 4
The English Renaissance to 1660 1, 2, 3, 4
The Restoration and the Eighteenth Century 1, 2, 3, 4
The Nineteenth Century and After 1, 2, 3, 4
American Literature 1, 2, 3, 4
English Poetry 1, 2, 3, 4
Dramatic Literature 1, 2, 3, 4
Prose Fiction 1, 2, 3, 4
Folk-Literature 3, 4
Creative Writing 2, 3

Language requirement for Master's degree, proficiency in one: Greek, Latin, French, German, Italian.

In general, thirty-six hours of college English will be required of all applicants; but college work of good quality in allied literatures may be counted against a shortage. Training in the Greek and Latin languages and literatures is especially acceptable.

All applicants should include among their papers the results of the Graduate Record Examination (Aptitude, Profile, and Advanced Tests). See p. 7.

Those who wish advice regarding choice of subject or a proper director for the work they have in mind may write to the Department of English, Goldwin Smith Hall.

Applicants for the doctorate will be admitted as noncandidates, under supervision of the chairman of the Department. They must take a candidacy examination given by the staff within the first month of residence and, if successful, will be transferred to candidacy as of the first of the term. But those admitted at or very near the beginning of the term may be allowed, upon the decision of the chairman of the Department, to defer the examination for one term, and may recover the lost residence unit upon the recommendation of their Special Committees. All applicants may secure from the Department of English copies of a reading list upon which questions will be based.

For the Master's degree there are no special requirements in courses or subjects. Before receiving the Doctor's degree, candidates must demonstrate a knowledge of Old English, both language and literature. In all other matters of schedule, the candidate's Special Committee is the final authority and will help him select a profitable course.

During the period from July to September, members of the staff will not ordinarily advise candidates or supervise Summer Research.

In addition to the fellowships described above, the department awards part-time teaching positions to some candidates for advanced degrees.

GERMAN *(ARTS)*

Professors E. KAHLER, *V. Lange,* W. G. MOULTON, W. F. OECHLER.

APPROVED MAJOR AND MINOR SUBJECTS

German Literature 1, 2, 3, 4 Germanic Linguistics 1, 2, 3, 4,

In the advanced courses in this field the work is twofold: literary and linguistic. The history of German literature from the earliest period to the present day is treated in lecture courses with collateral reading. Special topics are selected for detailed study, such as the epic and lyric poetry of the Middle High German period, the literature of the Baroque period, the age of Goethe, the drama of the nineteenth century, and contemporary literature. The courses offered in German linguistics include the study of Gothic, Old Saxon, and Old and Middle High German; they also afford an introduction to the methods of descriptive, historical, and comparative linguistics as applied to Germanic languages. The seminar in German literature aims to impart the principles and methods of investigation, a knowledge of the bibliographical resources, and a familiarity with the theories of literary criticism.

Candidates for the Ph.D. with a major in German literature must select Germanic linguistics as one of their minors; candidates for the Ph.D. with a major in Germanic linguistics must select German literature as one of their minors. Candidates for advanced degrees in German are expected to have an adequate knowledge of French and Latin.

MUSIC *(ARTS)*

Professors W. W. AUSTIN, *D. J. Grout,* R. L. HULL, R. M. PALMER.

APPROVED MAJOR AND MINOR SUBJECTS

Musical Composition 2, 3, 4 Musicology 1, 2, 3, 4

Theory of Music 2, 3, 4

Language requirement for Master's degree: for majors in the history of music or musicology, proficiency in French and German; for majors in composition or theory, proficiency in French or German.

Candidates are expected to take active interest in musical performance. All candidates are tested for musical proficiency: singing and playing unfamiliar music at sight, score reading, and fluency at the keyboard; on the basis of these tests, students may be advised to enroll in undergraduate courses or to undertake extracurricular work in musical practice and theory. Choral and orchestral organizations of the University and the community welcome graduate students and their wives or husbands as members.

Normally students whose major subject is theory or composition choose history or musicology as a minor subject, and vice versa. Doctoral candidates choose a second minor subject in a related Field. It is especially important for doctoral candidates to equip themselves with a good reading knowledge of both French and German as early as possible.

A large microfilm collection of Renaissance music and music theory is available to qualified candidates working in this Field.

SUSAN LINN SAGE SCHOOL OF PHILOSOPHY *(ARTS)*

Professors R. Albritton, Max Black, S. M. Brown, Jr., E. A. Burtt, Norman Malcolm, John Rawls, Irving Singer, H. R. Smart, and *Gregory Vlastos.*

The Susan Linn Sage School of Philosophy was founded through the generosity of the late Henry W. Sage, who endowed the Susan Linn Sage Professorship and gave in addition $200,000 to provide permanently for instruction and research in philosophy.

The Philosophical Review, supported by the University and issued under the auspices of the Sage School, is a quarterly journal devoted to the interests of philosophy, including logic, metaphysics, ethics, aesthetics, the history of philosophy, and the philosophy of religion. By the terms of its establishment, *The Review* is an absolutely free organ of philosophical scholarship, not devoted to the propagation of any doctrine.

APPROVED MAJOR AND MINOR SUBJECTS

Aesthetics 1, 2, 3, 4
Epistemology 1, 2, 3, 4
Ethics 1, 2, 3, 4
History of Philosophy 1, 2, 3, 4
Logic 1, 2, 3, 4
Metaphysics 1, 2, 3, 4
Philosophy 4
Philosophy of Religion 1, 2, 3, 4
Political Philosophy 1, 2, 3, 4

The instruction offered to graduate students presupposes such undergraduate courses in the subject as would be taken by a student in the College of Arts and Sciences of Cornell University who had elected philosophy as a major subject. Those who have not had equivalent preparation are expected to make up their deficiencies outside the work required for an advanced degree.

The Sage School provides opportunity for advanced study to two classes of graduate students: (1) those whose major interest is in some branch of philosophy; (2) those whose chief branch of research is in allied fields but who desire to supplement this with a minor in philosophy.

1. Students whose major interest is in philosophy are required (a) to gain a general knowledge of the whole subject including its history, and (b) to select some aspect or subdivision of it for intensive study and research.

2. Graduate students having a major interest in literature or the arts, in history or social studies, or in mathematics or a branch of experimental science, are permitted to choose a minor in philosophy with such emphasis as best suits their needs. For such students the School endeavors to outline a plan of philosophical study (in courses or directed reading) which will form a natural supplement to their field of research.

ROMANCE STUDIES *(ARTS)*

Professors F. B. Agard, *M. G. Bishop,* J. Colligno n, G. I. Dale, R. A. Hall, Jr., and B. L. Rideout.

APPROVED MAJOR AND MINOR SUBJECTS

French Linguistics 1, 2, 3, 4
French Literature 1, 2, 3, 4
Italian 1, 2, 4
Romance Linguistics 1, 2, 3, 4
Spanish Linguistics 1, 2, 3, 4
Spanish Literature 1, 2, 3, 4

A working knowledge of Latin is especially desirable for all candidates for advanced degrees in this field. All candidates for the degree of Doctor of Philosophy must satisfy the language requirement in French and German before beginning to

earn the fourth residence unit. A graduate student in Romance Studies should have completed some formal course of study in the language and literature of the language which he intends to select as his major subject and should have adequate preparation for advanced work in his minor subjects.

RUSSIAN *(ARTS)*

Professors G. H. Fairbanks (Linguistics), *Vladimir Nabokov* (Literature).

APPROVED MAJOR AND MINOR SUBJECTS

Russian Literature 1, 2, 3, 4

Slavic Linguistics 1, 2, 3, 4

Course offerings in Slavic linguistics include Old Bulgarian and Old Russian; they also include courses in descriptive, historical, and comparative methods of analysis applied to the Slavic languages. Candidates for advanced degrees with a major in Slavic linguistics should have a reading knowledge of both French and German; candidates for the Ph.D. with a major in Slavic linguistics are expected to develop proficiency in a second Slavic language.

SPEECH AND DRAMA *(ARTS)*

Professors H. D. Albright, R. W. Albright, C. C. Arnold, Harry Caplan, G. A. McCalmon, W. H. Stainton, C. K. Thomas, H. A. Wichelns.

APPROVED MAJOR AND MINOR SUBJECTS

Division of Rhetoric and Public Address:

Rhetoric and Public Address 1, 2, 3, 4

Principles of Public Address 3, 4

Classical and Medieval Rhetoric 3, 4

Division of Dramatic Production:

Drama and the Theatre 1

Dramatic Production 2, 3, 4

Playwriting 2, 3, 4

Division of Phonetics:

Speech and Phonetics 1, 2, 3, 4

General Linguistics 1, 2, 3, 4

See also General Linguistics *(Arts)*

The chief aim of graduate work in rhetoric and public address and in dramatic production is to develop competent investigators and teachers for colleges and universities. In many cases, the work will require more than the minimum periods of residence. Ordinarily, residence in this University during at least two academic years will be necessary for the doctorate.

A requirement for major candidates in speech and phonetics is training in a foreign language equivalent to three college entrance units, or in two foreign languages equivalent to two college entrance units in each.

Candidates for the Doctor's degree whose major interest is in rhetoric, that is, in the principles, history, and criticism of public address, will usually choose one minor subject from the field of literary history and criticism or from that of the social sciences.

Candidates for the Doctor's degree whose major interest is in drama and the theatre will be required to take dramatic literature as a minor subject, unless they have already pursued systematic study in dramatic literature, and such candidates must expect to be in residence two years and one summer beyond the requirements for the Master's degree. If preparing for general teaching, candidates will be advised to take additional courses in public speaking and speech training.

Candidates for the Master's degree in dramatic production will require at least one academic year and one summer session of residence.

Students in the Division of Dramatic Production will be expected to avail themselves of the opportunities for theatre practice afforded by various branches of The Cornell University Theatre.

Social Sciences

AGRICULTURAL ECONOMICS *(AG.)*

Professors M. C. Bond, C. A. Bratton, M. E. Brunk, S. K. Christensen, H. E. Conklin, L. C. Cunningham, L. B. Darrah, L. H. Davis, Herrell DeGraff, B. A. Dominick, W. G. Earle, V. B. Hart, *G. W. Hedlund,* F. F. Hill, T. N. Hurd, C. D. Kearl, M. S. Kendrick, E. A. Lutz, J. W. Mellor, E. G. Misner, F. A. Pearson, M. P. Rasmussen, K. L. Robinson, Leland Spencer, B. F. Stanton, R. P. Story, S. W. Warren.

APPROVED MAJOR AND MINOR SUBJECTS

Economics of Agriculture 1, 2, 3, 4
Farm Management 1, 2, 3, 4
Prices and Statistics 1, 2, 3, 4
Marketing and Business Management 1, 2, 3, 4
Public Administration and Finance 1, 2, 3, 4

A broad knowledge of the physical and biological aspects of agriculture is valuable background for graduate work in the field of agricultural economics. Undergraduate training should include the basic sciences as well as courses in the production, handling, and processing of farm products. (An undergraduate major in Agricultural Economics is not required for graduate work in this field.) Firsthand experience in farming is desirable in the attainment of proficiency in the field.

Candidates for the Doctor's degree in addition to selecting a major may also select a minor from the above list of approved major and minor subjects but should choose a second minor from among subjects offered elsewhere in the University.

The Department offers opportunities for study and research in the following specialized branches: Farm Management, Farm Finance, Marketing, Prices, Statistics, Business Management, Public Administration and Finance, Agricultural Land Economics, Agricultural Geography, and Agricultural Policy. Students have the opportunity and are encouraged to take courses in related fields such as Economics, Statistics, and Mathematics.

The Department has excellent facilities for study and research. Offices are supplied for graduate students and laboratories equipped with modern calculating machines are available.

Assistantships are available that provide an opportunity for part-time employment in teaching, research, or extension. Assistants normally conduct their thesis research as part of their assistantship duties in connection with departmentally financed projects.

The Department does not require a foreign language for the degree of Master of Science.

BUSINESS AND PUBLIC ADMINISTRATION

Professors M. G. de Chazeau, A. M. Hillhouse, R. S. Holmes, J. G. B. Hutchins, E. H. Litchfield, R. E. Neustadt, A. E. Nilsson, J. M. Rathmell, W. H. Shannon, P. P. Van Riper.

APPROVED MAJOR AND MINOR SUBJECTS

Business and Public Administration 1, 4

The professional degrees of Master of Business Administration and Master of Public Administration are awarded by action of the faculty of the School of Business

and Public Administration under conditions imposed by that faculty and the prospective candidate should consult the *Announcement of the School of Business and Public Administration.*

Every candidate for the degree of Ph.D. with a major in Business and Public Administration will be expected to demonstrate (1) a sound grasp of the universals of business and public administration; (2) a comprehension of economic, political, social and strategic factors in policy formulation; (3) a knowledge of statistical, accounting, economic, and financial tools of management control and analysis in the area of his special interest; (4) the ability competently to conduct and to present a research problem; and (5) familiarity with, and analytical competence in, the literature and the problems of that phase of administration on which he has concentrated.

A candidate who offers Business and Public Administration as a minor will be expected to demonstrate (1), (4), and (5).

Within the broad field of Business and Public Administration, the candidate will be expected to select, with the aid and approval of his special committee, a more limited area for concentration of study and research. Such areas of concentration are limited only by the research interests of the faculty. Purely for illustration, they might include accounting, finance, business economics and history, comparative public administration, city management, personnel management and communications, transportation, business or public management.

A number of fellowships and scholarships are made available each year for candidates for the Ph.D. degree in Business and Public Administration; see Fellowships and Scholarships, p. 23.

CHILD DEVELOPMENT AND FAMILY RELATIONSHIPS *(H.E.)*

Professors A. L. Baldwin, M. L. Barrett, W. L. Brittain, U. Bronfenbrenner, R. H. Dalton, E. C. Devereux, Jr., H. Feldman, *M. E. Ford,* J. Harding, L. D. Rockwood, K. M. Reeves, A. Shire, E. B. Waring, F. I. Wilson.

APPROVED MAJOR AND MINOR SUBJECTS

Child Development and Family Relationships 1, 2, 3, 4	Child Development 3, 4
	Family Relationships 3, 4

As a basis for graduate work some training in the social sciences or related disciplines is desirable. As a background for advanced work some experience in one of the following areas is also desirable: teaching or other experiences with children, adolescents, or adults; social or clinical work; or extension teaching or administration. However, admission to graduate work is based primarily on evidence of the student's competency to do advanced work and on broad preparation as a basis for specialization. Opportunities to acquire background in the social sciences are available, and the graduate student with relatively little preparation in the social sciences should plan on additional time for the completion of his degree.

Laboratory experience is provided in the Department nursery school, in public nursery schools, in play groups in settlement houses, and in other organized groups with school-age children. Insofar as facilities are available, graduate students are helped to find ways to put their knowledge into practice.

The department has currently two major research projects in which students may participate for the purposes of training and research. One project is a long-range interdisciplinary series of researches in social growth. The other project is concerned with child-rearing practices.

Several teaching and research assistantships are available. These are usually awarded to advanced graduate students. Application should be made directly to the

Department of Child Development and Family Relationships.

Since the subject matter in child development and family relationships requires an interdisciplinary approach, students are encouraged to supplement their work in the department with study in related areas. For related courses, see the departments in the *Announcements* indicated: Departments of Psychology and Sociology and Anthropology *(Arts);* Departments of Rural Education and Rural Sociology *(Ag.);* School of Education *(Ed.);* and School of Industrial and Labor Relations *(I.L.R.).*

CITY AND REGIONAL PLANNING *(ARTS)*

(See page 38.)

ECONOMICS *(ARTS)*

Professors G. P. Adams, Jr., M. A. Copeland, M. G. de Chazeau, J. G. B. Hutchins, A. E. Kahn, M. S. Kendrick, R. E. Montgomery, Chandler Morse, J. E. Morton, P. M. O'Leary, H. L. Reed.

APPROVED MAJOR AND MINOR SUBJECTS

Economic History 1, 2, 3, 4

Economic Theory and Its History 1, 2, 3, 4

Industrial Organization, Control and Finance 1, 2, 3, 4

International Economics 1, 2, 3, 4

Labor Economics 1, 2, 3, 4

Monetary Economics and Fiscal Policy 1, 2, 3, 4

Public Finance 1, 2, 3, 4

Economic Statistics 1, 2, 3, 4

Trade Fluctuations and Determination of Output and Income 1, 2, 3, 4

Language requirement for Master's degree: college entrance language.

1. All candidates for the degree of Ph.D. with major in economics will be required to demonstrate competence in at least three subsidiary fields selected from the list of approved major and minor subjects in addition to their chosen major and minor subjects. One of these subjects must be economic theory and its history unless that is selected as a major or minor subject.

2. All candidates for advanced degrees who elect a minor in economics will be held for work in economic theory.

3. Candidates for advanced degrees with major in economics may elect one minor subject from another field, or may, with the approval of their Special Committees, substitute subjects outside economics for one or two of those listed above.

4. Applications for fellowships and scholarships in economics should be filed with the Dean of the Graduate School prior to March 1. Applications for teaching fellowships, however, should be made directly to the chairman of the Department of Economics.

ECONOMICS OF THE HOUSEHOLD AND HOUSEHOLD MANAGEMENT *(H.E.)*

Professors E. C. Bratton, E. L. Conrad, E. M. Cushman, M. K. Heiner, D. M. Klitzke, *M. A. Rollins,* J. Warren, L. J. Williamson.

APPROVED MAJOR AND MINOR SUBJECTS

Economics of the Household and Household Management 1, 2, 4

Economics of the Household 2, 3, 4 Household Management 2, 3, 4

Students selecting a major in economics of the household and household management are expected to take courses in both phases of the field; for the degree of Ph.D. the minor subjects are usually selected to support one phase or the other. Appropriate minor subjects may be chosen fom a variety of fields including other branches of home economics, as well as agricultural economics, economics, education, psychology, sociology.

As a background for graduate work in this field, a well-rounded undergraduate program in home economics is preferable, in general, to specialization. Undergraduate courses in mathematics, statistics, economics, history, sociology, psychology, physics, chemistry, physiology, and bacteriology are also useful.

No language is required for the Master's degree.

EDUCATION AND RURAL EDUCATION *(ED.)*

Professors J. S. Ahmann, H. G. Andrus, Sara Blackwell, J. M. Brophy, R. H. Dalton, L. H. Elliott, L. A. Emerson, Jean Failing, F. S. Freeman, M. D. Glock, Eva Gordon, L. B. Hixon, Helen Hoefer, E. R. Hoskins, Margaret Hutchins, P. G. Johnson, Loretta Klee, C. L. Kulp, W. R. Kunsela, J. P. Leagans, C. B. Moore, Helen Moser, A. G. Nelson, Irene Patterson, Isabel Peard, Katherine Reeves, W. A. Smith, F. H. Stutz, Ethel Waring, *A. L. Winsor; Deans* Frank Baldwin and Dorothy V. N. Brooks.

APPROVED MAJOR AND MINOR SUBJECTS

Agricultural Education 1, 2, 3, 4
Education 3, 4
Educational Administration and and Supervision 1, 2, 3, 4
Educational Psychology and Measurement 1, 2, 3, 4
Elementary Education 1, 2, 3, 4
Extension and Adult Education 1, 2, 3, 4
Guidance and Personnel Administration 1, 2, 3, 4
History and Theory of Education 1, 2, 3, 4
Home Economics Education 1, 2, 3, 4
Industrial Education 1, 2, 3, 4
Nature, Science and Conservation Education 1, 2, 3, 4
Secondary Education and Curriculum 1, 2, 3, 4

Students in education may be admitted to candidacy for two types of advanced degrees: (1) the general degrees, M.A., M.S., or Ph.D., or (2) the professional degrees, M.Ed., or Ed.D. Requirements for (2) and a listing and description of courses in this field are to be found in the *Announcement of the School of Education.*

The requirements for admission to candidacy for the general degrees are the same as those for the professional degrees. In the field of education there is no foreign language requirement for Masters' degrees unless stipulated by the candidate's Special Committee.

FAR EASTERN STUDIES *(ARTS)*

Professors Knight Biggerstaff, J. M. Echols, C. C. Fisher, F. H. Golay, M. R. Goodall, C. F. Hockett, G. McT. Kahin, M. E. Opler, N. A. Pattillo, B. F. Ryan, *H. E. Shadick,* Lauriston Sharp.

APPROVED MAJOR AND MINOR SUBJECTS

Chinese Literature 1, 2, 3, 4
Far Eastern Studies 3, 4

Requirements for the Doctor's degree with a major in Chinese literature: (1) familiarity with representative works in classical and vernacular Chinese; (2) broad

knowledge of the available translations of Chinese literature and critical studies in Western languages; (3) specialized knowledge of at least two subfields such as the Confucian or Taoist classics, poetry, drama, fiction, classical prose, or twentieth-century writings.

The requirements for the M.A. degree or for a minor in Chinese literature are roughly equivalent to (1) and (2) above.

The requirements for the minor in Far Eastern Studies include a thorough factual knowledge of China or Southeast Asia or India and a general acquaintance with the other two of these areas.

The department administers special interdisciplinary area programs on China, Southeast Asia, and India. These are fully described in the *Announcement of the Department of Far Eastern Studies,* obtainable from the department, Morrill Hall. Graduate students in the China program may major in Far Eastern history (see History and Social Sciences) or in Chinese literature; or they may minor in these fields or in Far Eastern Studies, with the major in another field. Graduate students in the Southeast Asia or India programs may major in any field for which study of these areas is relevant; they minor in Far Eastern Studies.

Several assistantships are available for which application should be made directly to the Department of Far Eastern Studies. A number of special fellowships are available to students in the Southeast Asia and India programs; see Fellowships and Scholarships, p. 24.

The Wason Collection is a unique European-language library on China and the Chinese and includes also some fifty thousand volumes in Chinese. European-language materials on Southeast Asia and India also excell and are steadily being augmented by books and periodicals in the languages of these areas.

GENERAL LINGUISTICS *(ARTS)*

Professors F. B. Agard, *J M. Cowan,* G. I. Dale, J. M. Echols, G. H. Fairbanks, W. H. French, R. A. Hall, Jr., C. F. Hockett, W. G. Moulton, C. K. Thomas, J. F. White.

APPROVED MAJOR AND MINOR SUBJECTS

General Linguistics 1, 2, 3, 4

The following more specialized linguistic fields, listed elsewhere, are also available: Speech and Phonetics (see Speech and Drama); Latin language, Greek language (see the Classics); Old and Middle English (see English Language and Literature); Germanic linguistics (see German Studies); French, Spanish, and Romance linguistics (see Romance Studies); and Slavic Linguistics (see Russian Studies). In any of these, emphasis is laid on (1) methodology, and (2) the body of results already attained in the field; in general linguistics the primary emphasis is on (1), and in the linguistics of a specified language or group of languages the primary emphasis is on (2).

Candidates for the M.A. with a major in general linguistics are required to have a reading knowledge of either French or German. Candidates for the Ph.D. with a major in general linguistics are required to have a reading knowledge of both French and German and to elect cultural anthropology as one of their minors.

The Cornell Linguistics Club, open to all interested, meets biweekly throughout the school year and affords an opportunity for the presentation and discussion of current developments in linguistics.

GOVERNMENT *(ARTS)*

Professors H. W. Briggs, R. E. Cushman, A. T. Dotson, *Mario Einaudi,* G. McT. Kahin, H. M. Roelofs, C. L. Rossiter.

APPROVED MAJOR AND MINOR SUBJECTS

American Government and Institutions 1, 2, 3, 4
Comparative Government 1, 2, 3, 4
Constitutional Law 1, 2, 3, 4
International Law and Organization 1, 2, 3, 4
International Relations 1, 2, 3, 4
Political Theory 1, 2, 3, 4
Public Administration 1, 2, 3, 4

For graduate work in government a candidate should have a general knowledge of political science, history, economics, and international affairs. It is recommended that candidates for the Ph.D. with major study in government should take at least one minor outside the field.

In addition to the qualifying and final examinations, candidates for the Ph.D. with a major in government will be required to pass a comprehensive examination, oral and written, prior to the completion of four terms of residence and before commencing work on the thesis. This examination shall comprise American government and institutions, political theory, and three additional subjects to be selected by the candidate either (1) from the approved major and minor subjects listed by the Field; or (2) where minor subjects are taken outside the Field, from such minors as may be required by the professor in charge.

The attention of students desiring to do graduate work in public law is directed to opportunities open to them in the Law School. Members of the Faculty of the Law School may serve as members of Special Committees where appropriate arrangements have been made.

HISTORY *(ARTS)*

Professors KNIGHT BIGGERSTAFF, E. W. FOX, *P. W. Gates,* HENRY GUERLAC, M. L. W. LAISTNER, F. G. MARCHAM, C. P. NETTELS, CARL STEPHENSON, MARC SZEFTEL.

APPROVED MAJOR AND MINOR SUBJECTS

American History 1, 2, 3, 4
Ancient History 1, 2, 3, 4
Chinese History 1, 2, 3, 4
English History 1, 2, 3, 4
History of Science 1, 2, 3, 4
Medieval History 1, 2, 3, 4
Modern European History 1, 2, 3, 4
Slavic History 1, 2, 3, 4

For graduate work in history a student should have a general knowledge of history, government, and other social studies. He should be able to read French, German, and any other foreign language required for work in his special field. For major work in ancient history he needs a reading knowledge of both Greek and Latin; for major work in medieval history a reading knowledge of Latin; for major work in Chinese history a reading knowledge of Chinese; for major work in Slavic history, a reading knowledge of Russian. Such linguistic training should preferably be obtained by the student during his undergraduate years, but deficiencies can be made up after admission to the Graduate School. Candidates taking major work in history may take minors in history or in other Fields, such as government, economics, sociology, philosophy, literature, or industrial and labor relations.

Several assistantships are available. Prospective students interested in applying for such should write directly to the Department of History, Boardman Hall.

HOME ECONOMICS, GENERAL *(H.E.)*

Professors: See Child Development and Family Relationships, Economics of the Household and Household Management, Food and Nutrition, Home Economics Education, Housing and Design, Institution Management, Textiles and Clothing. *V. True.*

APPROVED MINOR SUBJECT

General Home Economics 5

For students who wish the minor to give breadth of contact with the field of home economics rather than depth in one area. Courses to be selected from the offerings in several of the areas of home economics.

HOME ECONOMICS EDUCATION *(H.E., ED.)*

Professors S. Blackwell, H. Hoefer, M. Hutchins, H. Moser, *I. Patterson.*

APPROVED MAJOR AND MINOR SUBJECTS

Home Economics Education 1, 2, 3, 4

The types of advanced degrees for which graduate students majoring in home economics education may become candidates are: (1) Master of Science; (2) Master of Education; (3) Doctor of Philosophy; (4) Doctor of Education. For (2) and (4) see the *Announcement of the School of Education.*

A candidate for an advanced degree with a major or minor in home economics education is expected to have an undergraduate major in home economics and some courses in education. Experience in teaching children and adults is desirable as a basis for graduate work and may be accepted in some cases in lieu of undergraduate courses.

Graduate students may prepare for some specialized phase of home economics education, such as adult education, extension teaching, secondary school teaching, college teaching, administration and supervision of home economics programs, and research in home economics education. Opportunities are available for students to observe and participate in home economics programs at all grade and age levels through the schools, the extension service, and other agencies. Those who wish to do so may participate in the research program of the Home Economics Education Department which is focused on appraising high school home economics programs. The current emphasis in this research is in the areas of child development and family relationships.

All candidates for advanced degrees in home economics education are expected to acquire (1) a general knowledge of the history and philosophies of education; a doctoral candidate with a major in home economics education should also develop: (2) a thorough understanding of the principles of curriculum development, educational psychology, teaching methods, and evaluation; and their application to homemaking education; and (3) an understanding of research methods in education.

A doctoral candidate with a minor in home economics should have, in addition to a general knowledge of history and philosophy of education, some understanding of the principles of curriculum development, educational psychology, teaching methods, and evaluation.

A Master's candidate with a major in home economics education should have, in addition to a general knowledge of history and philosophy of education, some understanding of the principles of curriculum development, educational psychology, teaching methods, and evaluation.

HOTEL ADMINISTRATION *(HOTEL)*

Professors J. H. Barrett, C. E. Cladel, J. Courtney, G. *W. Lattin,* H. B. Meek, F. H. Randolph, H. J. Recknagel, C. I. Sayles, T. W. Silk, L. Toth.

APPROVED MAJOR AND MINOR SUBJECTS

Hotel Administration 1, 2, 4 Hotel Accounting 2, 3, 4

Graduate work in the field of hotel administration is open to those who have completed in full the requirements for the undergraduate degree in the school of Hotel Administration and to them only.

Students who hold Bachelors' degrees in the liberal arts or in general business administration who wish a program in hotel administration normally enroll in the undergraduate division. They may become candidates for an additional Bachelor's degree or at their choice simply enroll for a specialized program of hotel administration courses suited to their particular needs.

HOUSING AND DESIGN *(H.E.)*

Professors R. R. Arnold, G. H. Beyer, H. J. Cady, J. E. Montgomery, *S. Neblett,* C. Straight, V. True.

APPROVED MAJOR AND MINOR SUBJECT

Housing and Design 1, 2, 3, 4

Language requirement for Master's degree: college entrance language.

For the degree of M.S. with a major in housing and design the work may be focused in housing (including only the nontechnical or "social" aspects) or in design. Acceptable background preparation for students who choose the housing focus includes the general areas of sociology or psychology; economics, marketing, or finance; architecture or city planning; home economics; and public health. Acceptable background preparation for students who choose the design focus includes the general areas of fine arts, sociology or psychology, architectural design, home economics, and a demonstrated knowledge of design and color. In some of these subjects specialization in only relevant branches of the area is acceptable for either focus. The student should have a general knowledge of the basic concepts of the particular area (or branch of the area) as they apply to the field of housing and to the field of design.

The program for the degree of M.S. varies for each phase of study. Flexibility in programing cares for varying backgrounds and objectives of students. A student desiring a housing focus must obtain a comprehensive knowledge of one of the areas in this field. The student is required to fill in gaps in his background where they exist in such areas as sociology, psychology, architecture (where appropriate courses are available), statistics, and research methods. A student desiring a design focus must obtain a comprehensive knowledge of one of the areas in this field. The candidate is required to fill in gaps in his background where they exist in such areas as design, history of art, home economics, sociology or psychology, research methods. The candidate should choose a minor in a related area.

For work toward the Doctor's degree with a major in housing and design the student must expand his knowledge beyond the specialized area in which he focused for work toward the Master's degree. Any requisites described above under the program for the Master's degree must be filled. In addition, some personal experience in either teaching, business, or government is requisite. Two minors are selected from fields related to housing and design.

The student should obtain a thorough knowledge of three of the important areas in which extensive housing research has been undertaken at this University, such as housing values, urban versus rural family housing needs, problems of existing housing inventories, prefabricated housing, problems of decentralization and commuting from rural areas, and any new research areas which may be explored from time to time. Participation is desirable in the housing research studies being undertaken at the University: either in studies where the leadership is in the Department of Housing and Design and the studies are conducted under the Agricultural Experiment Station of Cornell University on New York State funds, or in studies being con-

ducted under the Cornell Housing Research Center. During certain years there are one or more assistantships which are available to advanced graduate students.

INDUSTRIAL AND LABOR RELATIONS *(I.L.R.)*

Professors M. P. CATHERWOOD, L. P. ADAMS, R. L. ARONSON, E. BROOKS, J. M. BROPHY, T. BURLING, J. CARPENTER, M. G. CLARK, R. CORVINI, L. A. EMERSON, R. H. FERGUSON, P. GORDON, *C. A. Hanson,* W. HODGES, V. H. JENSEN, M. R. KONVITZ, A. H. LEIGHTON, D. M. MCINTYRE, P. J. MCCARTHY, J. W. MCCONNELL, J. T. MCKELVEY, J. G. MILLER, R. E. MONTGOMERY, J. E. MORTON, M. F. NEUFELD, O. ORNATI, M. PERLMAN, R. RAIMON, A. W. SMITH, N. A. TOLLES, W. F. WHYTE, B. F. WILLCOX, A. L. WINSOR.

APPROVED MAJOR AND MINOR SUBJECTS

Collective Bargaining, Mediation, and Arbitration 1, 2, 3, 4
Economic and Social Statistics 1, 2, 3, 4
Human Relations in Industry 1, 2, 3, 4
Industrial and Labor Relations Problems 4
Industrial Education 1, 2, 3, 4
Labor Market Economics and Analysis 1, 2, 3, 4
Labor Union History and Administration 1, 2, 3, 4
Personnel Administration 1, 2, 3, 4
Social Security and Protective Labor Legislation 1, 2, 3, 4

Language requirement for Master's degree: proficiency in one language approved by the Special Committee before beginning the second residence unit.

A description of the program leading to the degree of Master of Industrial and Labor Relations, which is designed to provide broad coverage and some specialization, is found in the *Announcement of the School of Industrial and Labor Relations.*

For both the M.S. and Ph.D. degrees emphasis is placed upon independent study and research. The following are minimum requirements prerequisite to the independent investigations required in the major or minor subjects:

COLLECTIVE BARGAINING, MEDIATION, AND ARBITRATION. For a major in this subject, the candidate must show knowledge of (1) the history, current developments, and issues in labor relations, collective bargaining practices and procedures; (2) the content of trade agreements in different types of industry; (3) state and federal legislation in the field of labor relations, collective bargaining, mediation, and arbitration; (4) leading cases in the field of labor law; (5) administrative agencies and their functions.

For a minor, (1), (3), and (5) are required.

ECONOMICS AND SOCIAL STATISTICS. For a major in this subject the candidate must show (1) good command of the principles of statistical reasoning; (2) proficiency in the use of statistical methods and in the processing of statistical data; (3) qualified skill in the application of proper statistical tools of analysis to a specific topic in economics or social studies, including a thorough knowledge of statistical sources; (4) knowledge of differential and integral calculus.

For a minor, (1), (2), (3) are required, the level being less advanced than for a major.

HUMAN RELATIONS IN INDUSTRY. For a major in this subject, the candidate must present (1) acquaintance with the fields basic in human and social behavior including biology, the physiology of the nervous system, and the psychology of the individual; (2) comprehensive knowledge of relevant areas in social psychology and cultural anthropology, especially the fundamentals of individual and group behavior

and the nature of institutions; (3) familiarity with the principal human relations problems commonly found in industrial and labor relations and the bearing of these problems on other fields such as collective bargaining, labor organization, management organization, economics, and law; (4) knowledge of the problems involved in the relationship between industries and communities; (5) thorough knowledge of pertinent research techniques and methods employed in human relations problems; (6) knowledge of resources generally available in educational techniques and in community services that have bearing on human relations problems.

For a minor, (1), (2), and (3) are required.

Industrial and Labor Relations Problems. (Offered as a minor only to graduate students in fields of study other than industrial and labor relations.)

A candidate for an advanced degree must have a general understanding of the subject matter in the field of industrial and labor relations. In order to prepare for a minor in this Field, the candidate will normally complete three to five courses in accordance with a program approved by his Special Committee.

Industrial Education. For a major in this subject, the candidate must show (1) comprehensive understanding of industrial and technical education programs in public institutions, private institutions, and industry; (2) ability to develop analyses for instructional purposes and prepare an educational or training program based upon analyses; (3) understanding of economic, social, and scientific factors which may modify industrial and technical education programs; (4) understanding of instructional methods and their application in learning situations; (5) ability to apply administrative and supervisory principles to industrial and technical education programs; (6) detailed knowledge of bibliographies and sources of information in this field.

For a minor, (1), (2), and (4) are required.

Labor Market Economics and Analysis. For a major in this subject, the candidate must show (1) comprehensive knowledge of the factors governing labor supply and demand; (2) thorough understanding of basic economic processes, especially in relation to employment, national income, production, wages, prices, and profits; (3) qualified skill in analyzing some specific labor market relationship such as manpower, labor mobility, wage determination, wage differentials, changes in wage structures, productivity, labor costs, or consumer incomes and expenditures; (4) competence in the use and application of quantitative methods; (5) knowledge of the history and the literature related to the subject.

For a minor, (1), (2), and (4) are required. When this subject is elected as a major, labor economics may not be elected as a minor.

Labor Union History and Administration. For a major in this subject, the candidate must present (1) a working knowledge of the history of the American labor movement; (2) a working knowledge of the government and administration of the American labor movement; (3) specific and detailed knowledge of the history, government, and administration of international and national labor unions in the United States; (4) familiarity with types of union leadership and rank-and-file behavior; (5) familiarity with the history, government, and administration of labor movements in other countries; (6) detailed knowledge of the bibliography and sources of information in this field.

For a minor in this subject, (1), (2), and (6) are required.

Personnel Administration. For a major in this subject, the candidate must present (1) comprehensive knowledge of the general principles of administration, including personnel organization and operation; (2) ability to appraise critically personnel methods and procedures; (3) knowledge of labor and industrial legislation and functions of government as they relate to the personnel function; (4) knowledge of

business and labor organizations and their impact on personnel relations; (5) insight concerning the basic attitudes modifying the relationships between individuals, groups, and organizations; (6) detailed knowledge of the bibliography and sources of information in this field.

For a minor, (1), (2), (3), and (6) are required.

Social Security and Protective Labor Legislation. For a major in this subject, the candidate must show (1) familiarity with the sources and nature of insecurity; (2) a comprehensive knowledge of the origin, development, constitutionality, and administration of legislation in such fields as social insurance, minimum wages and hours, protection of women and children, discrimination, health and safety, workmen's compensation, public assistance, and labor relations; (3) a knowledge of the efforts of labor, industry, and the community to meet these problems on a voluntary basis; (4) familiarity with one special field of legislation and the administrative and legal experience in that field; (5) knowledge of the past and current proposals for improving and extending legislation.

For a minor, (1), (2), and (5) are required.

Interviews are desired with all applicants. If at all possible, persons interested in admission should arrange for a visit to Ithaca. Inquiries concerning interviews should be directed to the Director, Office of Resident Instruction, New York State School of Industrial and Labor Relations.

Applications for graduate assistantships to begin in September should be received not later than March and, for February, not later than December 1. Write to the Director, Office of Resident Instruction, for application material.

The Carnegie Corporation of New York has granted funds for two-year fellowships in industrial psychiatry, which provide an opportunity for trained psychiatrists to study at the New York State School of Industrial and Labor Relations and to apply psychiatric knowledge and methods to the problems of industry in actual plant situations. Applicants must hold an M.D. degree and have completed a minimum of two years of approved training in psychiatry.

Note, also, the special Tuition Scholarships, p. 24.

INSTITUTION MANAGEMENT *(H.E.)*

Professors Katharine W. Harris, *Karla Longree.*

APPROVED MAJOR AND MINOR SUBJECTS

Institution Management 2, 4

A strong background of undergraduate courses in food and nutrition and the supporting physical and biological sciences and a well-balanced program in other areas of home economics are expected. Undergraduate courses in institution management and some experience in the field of managerial dietetics or commercial food service administration are desirable.

Graduate work leading to the Master's degree may emphasize either the administrative or the more technical aspects of institution management. There is no prescribed program of study for either the major or the minor in this field. It is expected that the program will supplement the student's previous training and experience to achieve a well-rounded knowledge of the subject, with due consideration given to the student's purpose in undertaking graduate study.

Related minors are in other branches of home economics, particularly food and/or nutrition, or in such subjects as personnel administration, agricultural marketing, hotel accounting, and education.

Members of the staff will direct work in the following areas: Professor Harris in studies concerned with the administrative problems of large-scale food service operations; Associate Professor Longree, experimental studies in food prepared in quantity.

The Department offers opportunities for experimentation in its laboratories, a cafeteria and a tea room which together serve approximately 1,800 persons daily, and a research kitchen. Several graduate assistantships are available.

LAW

Professors M. H. Cardozo, W. D. Curtiss, W. T. Dean, W. H. Farnham, H. A. Freeman, R. I. Fricke, L. W. Morse, R. B. Schlesinger, R. S. Stevens, G. J. Thompson, P. Ward, E. N. Warren, H. E. Whiteside, *B. F. Willcox*.

APPROVED MINOR SUBJECT

Law 4

SOCIOLOGY, RURAL SOCIOLOGY, AND ANTHROPOLOGY *(ARTS, AG.)*

Professors W. A. Anderson, M. L. Barron, L. S. Cottrell, Jr., *J. P. Dean* (Soc. & Anthrop.), A. R. Holmberg, W. W. Lambert, O. F. Larson, A. H. Leighton, J. W. McConnell, E. O. Moe, M. E. Opler, R. A. Polson, W. W. Reeder, M. Rosenberg, B. Ryan, L. Sharp, R. J. Smith, G. F. Streib, E. A. Suchman, *P. Taietz* (Rural Soc.), H. E. Thomas, A. J. Vidich, W. F. Whyte, R. M. Williams, Jr.

APPROVED MAJOR AND MINOR SUBJECTS

Sociology 1, 2, 3, 4	Cultural Anthropology 1, 2, 3, 4
Rural Sociology 1, 2, 3, 4	Statistics 2, 3, 4

Language requirement for the Master's degree (Soc. & Anthrop. only): *proficiency in one language acceptable to the Special Committee.*

For graduate work in any of these fields a student should have a general background in human biology, the social sciences, and the humanities. He should also have some knowledge of the basic concepts and applications of social statistics, although deficiencies in this respect can be made up in the course of his work as a graduate student. For graduate work in rural sociology the student should have had, in addition, considerable personal experience with rural life and institutions.

It is recommended that candidates for advanced degrees in Sociology, Rural Sociology, or Anthropology should take at least one minor outside these Fields.

There are several assistantships which are normally awarded to advanced graduate students. Applications should be made directly to the Department of Sociology and Anthropology or the Department of Rural Sociology.

These departments sponsor various social research programs and field projects in which graduate students may participate directly for purposes of training or research. One such large-scale current research program involving a series of community studies of intergroup relations in various parts of the United States, including a continuing study of a nearby industrial city, offers the graduate student a field laboratory for many different kinds of community research. Another is a combined program of instruction and research on the modernization of nonindustrialized areas. In connection with this applied anthropology program, continuing field research projects have been initiated in the American Southwest, South America, India, and Southeast Asia to study the effects of the introduction of modern technology in underdeveloped regions. These and other research programs are carried on under the auspices of the Cornell Social Science Research Center, which is described in the section on Research Centers. One of the functions of the Center is to train graduate students in research methods by permitting them to work on established, active research projects. In Rural Sociology a wide range of studies are conducted under the sponsorship of the Agricultural Experiment Station of Cornell University. These encompass a variety of subjects and stress both theory and application to significant

problems. Graduate students participate in planning and carrying out these projects under the supervision of the project leader. Some of the projects which are currently being conducted are: a study of social change in rural communities — this is a restudy of two communities which had been studied twenty-five years ago; a study of migrant laborers in New York — their social characteristics, attitudes, and leadership-followership patterns; a study concerned with some of the significant factors in the communication process in a community; and a study of retirement patterns in the rural population. A large project on factors related to the effectiveness of organizations is currently concerned with a study of program planning procedures and one on the significant role and situational factors involved in group membership and active participation.

Students interested in the application of research have the opportunity to observe and participate in the Department of Rural Sociology projects in extension work and in studies designed to test extension methods.

The requirements for the Doctor's degree are listed below. The requirement for the M.A. or M.S. degrees correspond generally to the minor requirements for the Doctor's degree. (For Social Psychology, see Psychology.)

GENERAL SOCIOLOGY. When offered as a major: (1) a thorough knowledge of the field of sociological theory and its history; (2) a thorough knowledge of the methodology of sociological research; and (3) a detailed knowledge of at least three subfields in sociology, such as the family, educational sociology, rural sociology, urban sociology, social pathology, criminology, population, statistics, and such related fields as cultural anthropology and social psychology.

When offered as a minor: a general knowledge of part (1) of the above requirement and a satisfactory knowledge of one or two subfields.

CULTURAL ANTHROPOLOGY. When offered as a major: (1) a thorough knowledge of the history of anthropology and of anthropological theory and method; (2) familiarity with the major culture areas of the world; (3) a detailed knowledge of the ethnology of at least one such area; (4) a grasp of the principles of linguistics and of physical anthropology, and familiarity with the most important findings of archaeology.

When offered as a minor: parts (1) and (2) of the above requirement.

RURAL SOCIOLOGY. When offered as a major: (1) a thorough knowledge of the field of sociological theory and its history; (2) a thorough knowledge of the methodology of sociological research; (3) a thorough knowledge of rural sociology and the research in this field; and (4) a detailed knowledge of at least three subfields in sociology, such as the family, educational sociology, rural sociology, urban sociology, social pathology, criminology, population, statistics, community organization, group work, and such related fields as cultural anthropology and social psychology.

When offered as a minor: a general knowledge of parts (1) and (3) of the above requirement and a satisfactory knowledge of one other subfield under part (4).

STATISTICS. When offered as a minor for the Ph.D. degree: (1) completion of an approved sequence of courses; (2) completion of a research project which demonstrates that the candidate is able to select methods appropriate to the problems and to employ advanced statistical methods.

STATISTICS *(AG., ARTS, ENGIN., I.L.R.)*

Professors I. BLUMEN, R. BECHHOFER, W. T. FEDERER, *P. J. McCarthy,* G. MCCREARY, J. E. MORTON, R. G. D. STEEL.

APPROVED MAJOR SUBJECT

Statistics 1, 2

Language requirement for Master's degree: proficiency in French, German, or Russian or an approved substitute before completion of the second residence unit.

The aim of graduate work in statistics is the training of individuals who will (1) have a thorough knowledge of the theoretical basis of modern statistical method and have demonstrated ability to make significant contributions to this theory, (2) have developed an understanding of the methods of scientific research in general and the role which statistics plays in this research, and (3) have had experience in aiding workers in various fields in the application of statistical method. For this reason, the minor subject or subjects must be taken with individuals outside the Field, and one minor will ordinarily be in the Field of Mathematics. Students preparing for graduate work in statistics are urged to obtain a thorough grounding in mathematics through advanced calculus since their program of study will be seriously delayed if this preparation is lacking. If their interest is primarily in mathematical statistics they should consult the announcement of the Field of Mathematics.

A student majoring in statistics must complete a graduate sequence of courses in mathematical statistics (offered in the Department of Mathematics) which has been approved by his committee. Other course work required of majors in statistics will be chosen from among offerings by the above listed members of the Field in the Departments of Plant Breeding *(Ag.)* and Sociology *(Arts)*, and the Schools of Mechanical Engineering *(Engin.)* and Industrial and Labor Relations *(I.L.R.)*. Provisions for minoring in statistics are given in the announcements of the Fields of Economics, Industrial and Labor Relations, Mathematics, Mechanical Engineering, Plant Breeding, and Sociology. A brochure on statistics may be obtained by writing to the Cornell Statistics Center, Warren Hall.

TEXTILES AND CLOTHING *(H.E.)*

Professors F. Y. Boak, G. L. Butt, M. Humphrey, E. F. McMurry, *M. S. Ryan,* O. K. Singleton, H. P. Smith, F. M. Spratt, E. E. Stout, M. V. White.

APPROVED MAJOR AND MINOR SUBJECTS

Textiles 2, 3, 4 Clothing 2, 3, 4

For students who wish to major or minor in the field of Textiles and Clothing, a wide variety of offerings is available both as to course work and opportunities for independent study. No set program of study is prescribed for majors and minors in this field. It is expected that the program will supplement the student's previous training. Broad home economics training as well as training in textiles and clothing is desirable. Deficiency in background courses is not necessarily a bar to admission, but it may increase the time needed to earn the degree. There is no language requirement.

Candidates for a Master's degree in the field of Textiles and Clothing are expected to acquire a general knowledge of all phases of the field and an understanding of research methods in textiles and clothing, and to concentrate in any one of the various areas of textiles and clothing.

Such facilities as a conditioning room, textile equipment, and a large collection of historical costumes are available for research. For further information concerning facilities, write to the Field Representative.

Ongoing research in the areas of textiles and psychology of clothing allow for student participation.

Students working toward a Doctor of Philosophy degree in allied fields may minor in textiles and clothing.

A limited number of assistantships are available in the department.

Biological Sciences

AGRICULTURAL ENGINEERING *(AG.)*

Professors L. L. Boyd, E. W. Foss, *O. C. French,* H. E. Gray, W. W. Gunkel, B. A. Jennings, G. Levine, W. F. Millier, E. S. Shepardson, J. W. Spencer, C. W. Terry, C. N. Turner.

APPROVED MAJOR AND MINOR SUBJECTS

Note: If the major for the M.S. degree is in the subject of Agricultural Engineering, the minor should not be elected from the other four subjects; if the major for the Ph.D. degree is in the subject of Agricultural Engineering not more than one of the other four subjects may be elected for a minor.

Agricultural Engineering 1, 2, 3, 4
Farm Electrification 1, 3, 4
Farm Structures 1, 3, 4
Power and Machinery 1, 3, 4
Soil and Water Engineering 1, 3, 4
See also Civil Engineering, p. 39 and Mechanical Engineering, p. 79)

To be admitted as a candidate for an advanced degree in this field an applicant will be required to have completed the equivalent of a recognized agricultural engineering curriculum with a scholarship ranking in at least the upper half of his class. A knowledge of general agriculture is also essential. This requirement may be satisfied by adequate general farm work experience or formal courses such as botany, soils, field crops, animal husbandry, and farm management.

An applicant who is not able to meet the requirements for candidacy for an advanced degree may arrange for a program of work as a noncandidate.

AGRONOMY *(AG.)*

Professors R. Bradfield, S. R. Aldrich, H. M. Austenson, K. C. Beeson, N. C. Brady, C. S. Brandt, F. E. Broadbent, M. G. Cline, J. E. Dawson, S. N. Fertig, W. L. Garman, H. B. Hartwig, W. K. Kennedy, D. J. Lathwell, H. A. MacDonald, R. D. Miller, R. B. Musgrave, M. H. Peech, E. L. Stone, P. J. Zwerman.

APPROVED MAJOR AND MINOR SUBJECTS

Soils 1, 2, 3, 4
Field Crop Production 1, 2, 3, 4

(a) Special Interests of the Faculty

Soils:

1. Soil chemistry: Professors Peech, Dawson, Beeson, and Brandt
2. Soil physics: Professor Miller
3. Soil microbiology: Professor Broadbent
4. Soil fertility: Professors Bradfield, Brady, Lathwell, and Garman
5. Soil morphology, genesis and cartography: Professor Cline
6. Soil conservation: Professor Zwerman
7. Forest soils: Professor Stone
8. Organic soils: Professor Dawson

Field crop production:

1. Forage crop production, management, and utilization: Professors Hartwig, MacDonald, Kennedy, and Austenson
2. Cereal crops and crop ecology: Professors Musgrave and Aldrich
3. Weed Control: Professor Fertig

Prospective students are urged to correspond with the professor in the above lists whose interests are nearest their own a few months in advance of the time they expect to enter.

(b) Policies Peculiar to the Field

Students preparing for graduate work in agronomy are urged to obtain a thorough knowledge of general physics, mathematics through calculus, analytical, organic, and physical chemistry, general botany, bacteriology, genetics, plant physiology, and geology. Opportunity will be afforded for further study of some of these subjects after entering the Graduate School, but a student deficient in two or more of these foundation courses cannot expect to receive a degree in the minimum time required for residence. Some practical farm experience with soil and crop management problems is also desirable. Opportunity to acquire additional experience will be afforded a limited number of students majoring in the field by summer employment on departmental projects.

Students must consult the professor in charge before registering for any course numbered above 100 (see *Ag.*, Agronomy).

ANIMAL BREEDING AND PHYSIOLOGY *(AG.)*

Professors S. A. Asdell, R. W. Bratton, J. H. Bruckner, R. K. Cole, R. H. Foote, G. O. Hall, W. Hansel, *C. R. Henderson,* F. B. Hutt, S. C. King.

APPROVED MAJOR AND MINOR SUBJECTS

Animal Breeding 1, 2, 4 Animal Genetics 1, 2, 4

Language requirement for the Master's degree: proficiency in French or German is required by Professors Cole and Hutt. The other professors in this Field usually require one language for the Master's degree if the student expects to become a candidate for the Ph.D.

Before entering graduate study in animal breeding, the student should have had courses in zoology, general biology, comparative anatomy, physiology, and chemistry, and elementary courses in genetics and animal breeding. Some practical experience in animal husbandry, poultry husbandry, or plant breeding is desirable.

In the course of their graduate study, students will be expected to take certain courses in animal physiology, biochemistry, embryology, cytology, genetics, biometry, and histology. One or more of these may be selected as a minor subject.

Graduate studies in animal breeding may be taken in several departments of the University, and the student should consult the course offerings of each of these departments.

Work in genetics and breeding of large animals, including physiology of reproduction, is offered in the Department of Animal Husbandry under the supervision of Professors Asdell, Bratton, Foote, Hansel, and Henderson.

Graduate study in animal genetics is offered in the Department of Poultry Husbandry, where work in that field is supervised by Professors Hutt, Cole, Bruckner, Hall, and King.

It is recommended that those candidates for the Master's degree who expect to become candidates for the doctorate study one or more foreign languages.

ANIMAL HUSBANDRY *(AG.)*

Professors S. A. Asdell, R. W. Bratton, H. W. Carter, C. M. Chance, R. H. Foote, W. Hansel, C. R. Henderson, J. K. Loosli, C. M. McCay, J. I. Miller, F. B. Mor-

RISON, J. T. REID, L. H. SCHULTZ, B. E. SHEFFY, S. T. SLACK, S. E. SMITH, G. W. TRIMBERGER, *K. L. Turk,* R. G. WARNER, G. H. WELLINGTON, J. P. WILLMAN.

APPROVED MAJOR AND MINOR SUBJECTS

Animal Husbandry 1, 2, 3, 4	Animal Breeding 1, 2, 3, 4
Animal Nutrition 1, 2, 3, 4	Dairy Husbandry 1, 2, 3, 4

Note: If the major for the Ph.D. lies in one of these fields, not more than one of the other three should be selected for a minor.

Although there are no foreign language requirements for the Master's degree, foreign language is recommended for those candidates who expect to go on for the Ph.D.

To enter graduate study in any of the subject matter fields in animal husbandry, the student should have the equivalent of the following courses: elementary feeds and feeding, animal breeding, and the various production courses in dairy and beef cattle, sheep, and swine. Also, the student should have basic courses in biology or zoology, bacteriology, chemistry, organic chemistry, mathematics, physics, animal physiology, and genetics.

In addition to the graduate courses in animal husbandry, candidates for the degrees of M.S. and Ph.D. will be expected to take advanced courses in chemistry, biochemistry, physiology, genetics, biological statistics, and other related fields.

ANIMAL NUTRITION *(AG.)*

Professors L. L. BARNES, G. F. HEUSER, F. W. HILL, *J. K. Loosli,* L. A. MAYNARD, C. M. MCCAY, F. B. MORRISON, L. C. NORRIS, J. T. REID, M. L. SCOTT, B. E. SHEFFY, S. E. SMITH, R. G. WARNER.

APPROVED MAJOR AND MINOR SUBJECTS

Animal Nutrition 1, 2, 4

To enter upon graduate study with animal nutrition as a major subject, the student should have preparation in general biology or zoology, introductory chemitsry, analytical chemistry, organic chemisty, physics, human or animal physiology, and animal breeding or genetics. Some preparation or experience in livestock or poultry production is desirable but not required.

In the course of preparation for an advanced degree, candidates are expected to acquire training in biochemistry, physiology, histology, and statistics. Students are generally advised to select either biochemistry or physiology as minor fields of study for the Master's degree and both of these subjects as minor fields for the doctorate. However, other minor fields of study such as animal breeding, pathology, or organic chemistry may be selected, depending upon the student's interest. Physical chemistry and advanced work in organic chemistry may be required of students particularly interested in the biochemistry of nutrition.

A strong research program in animal nutrition is maintained in the Cornell University Agricultural Experiment Station under the direction of members of the Faculty responsible for the training of graduate students in this field. Students are frequently able to broaden their research training and experience by participating in some of the animal nutrition projects of the Experiment Station. As a research problem for the degree, students are permitted to select, if they desire, various phases of established projects which permit them to exercise originality and independence of thinking.

Students expecting to continue their graduate studies should prepare to meet the language requirement for the doctorate during the course of their preparation for the Master's degree.

BACTERIOLOGY *(AG.)*

Professors E. A. Delwiche, G. Knaysi, H. B. Naylor, H. W. Seeley, Jr., J. M. Sherman, P. J. Vandemark, *M. R. Zelle.* At Geneva, *Professors* A. W. Hofer, G. J. Hucker, C. S. Pederson, K. H. Steinkraus.

APPROVED MAJOR AND MINOR SUBJECTS

Bacteriology 1, 2, 4 (See also Pathogenic Bacteriology 1, 2, 3, 4, p. 69)

Language requirement for Master's degree: college entrance language.

Students planning graduate study in bacteriology should have preparation in general chemistry, qualitative and quantitative analysis, and organic chemistry, and introductory courses in the biological sciences. In addition, training in physical chemistry and calculus is desirable. Deficiency in any of the subjects listed does not necessarily preclude admission but may increase the time necessary to earn a degree.

Well-equipped laboratories are available. Those fields of microbiological research in which the staff is experienced and especially interested include morphology and cytology, physiology and biochemistry, genetics, bacteriophagy, and systematic and applied bacteriology.

It is to be emphasized that in addition to a creditable performance in the formal program of courses leading to a broad knowledge of bacteriology and related fields, the graduate student for an advanced degree is expected to demonstrate ability to plan and conduct independent and original research. The successful culmination of a worthy research project is considered the important prerequisite to the Ph.D. degree.

BIOCHEMISTRY *(AG.)*

Professors W. L. Clark, L. J. Daniel, L. A. Maynard, A. L. Neal, W. L. Nelson, J. B. Sumner, *H. H. Williams.* At Geneva: *Professors* A. W. Avens, F. P. Boyle, D. B. Hand, J. C. Hening, R. W. Holley, Z. I. Kertesz, F. A. Lee, G. L. Mack, J. C. Moyer, W. B. Robinson, K. H. Steinkraus, A. C. Wagenknecht.

APPROVED MAJOR AND MINOR SUBJECTS

Biochemistry 1, 2, 4

A student desiring to undertake graduate work in biochemistry should possess a sound chemistry background and a broad training in the biological and physical sciences. Opportunity will be provided by the extension of the period of graduate study for the candidate to correct minor deficiencies in the above areas. It is recommended that those entering with a strong backgound in chemistry should choose a biological subject as a minor, and conversely, those with a strong background in biology should choose a branch of chemistry as a minor. The program of study, including the selection of minor subjects, will be governed by the student's background, needs, and interests. By proper selection of minor subjects the student may focus his graduate study on animal or plant biochemistry but is expected to be proficient in the general field.

Candidates who choose biochemistry as a minor should have adequate training in chemistry and the biological sciences.

The laboratories at Ithaca are especially equipped for research in enzyme chemistry, intermediary metabolism, nutritional biochemistry, analytical methods, plant and animal investigations, and food biochemistry (at Ithaca and Geneva).

Several assistantships are available each year and applications for these should be made directly to the Faculty representative.

BOTANY *(AG.)*

Professors H. P. Banks, D. G. Clark, R. T. Clausen, W. C. Muenscher, L. C. Petry, *L. F. Randolph,* F. C. Steward, and C. H. Uhl. At Geneva, *Professors* F. P. Boyle, B. E. Clark, W. F. Crosier, and John Einset. At the Bailey Hortorium, *Professors* G. H. M. Lawrence and H. E. Moore, Jr.

APPROVED MAJOR AND MINOR SUBJECTS

General Botany 2, 4
Cytology 1, 2, 3, 4
Economic Botany 1, 2, 3, 4
Paleobotany 1, 2, 3, 4
Plant Morphology and Anatomy 1, 2, 3, 4
Plant Physiology 1, 2, 3, 4
Plant Taxonomy 1, 2, 3, 4

Language requirement for Master's degree: college entrance French and/or German or proficiency before completion of second residence unit.

General Requirements for All Degrees

An adequate training in plant morphology and anatomy, plant physiology, and plant taxonomy is required of all candidates with major subjects in the field of botany.

Requirements for Major Subjects

Additional basic requirements for the major subjects are as follows:

General Botany. Additional requirements will be determined in each individual case.

Cytology and Cytogenetics. An adequate knowledge of cytology and two of the following: an adequate knowledge of genetics or plant breeding, additional training in plant morphology and anatomy, plant physiology, or plant taxonomy. Professors Randolph and Uhl.

Economic Botany. Additional training in plant physiology and plant taxonomy, and adequate knowledge of one of the following: bacteriology, genetics, mycology, or plant breeding. Professor Muenscher.

Paleobotany. Additional training in plant morphology and anatomy, and adequate knowledge of paleobotany and general and stratigraphic geology. Professors Banks and Petry.

Plant Morphology and Anatomy. Additional training in plant morphology and anatomy and plant taxonomy and adequate knowledge of cytology, genetics, or paleobotany. Professors Banks and Petry.

Plant Physiology. Additional training in plant physiology, an adequate knowledge of chemistry, a general knowledge of mathematics and physics, and training in bacteriology, genetics, mycology, plant pathology, or soils. Professors Clark and Steward.

Plant Taxonomy. Additional training in plant taxonomy and an adequate knowledge of cytology or genetics. Professors Clausen and Muenscher.

Opportunity for graduate research in plant taxonomy, with the same requirements, is also available to a limited number of graduate students at the Bailey Hortorium. Research programs at the Hortorium deal primarily with cultivated plants but are necessarily based on studies of indigenous plant populations. Professors Lawrence and Moore.

Research at the New York State Agricultural Experiment Station

Opportunity for graduate research is also available, in the fields of cytology and plant physiology, particularly of cultivated plants, and of seed investigations, at the New York State Agricultural Experiment Station at Geneva, N.Y.

CONSERVATION *(AG.)*

Professors J. C. Ayers, C. O. Berg, W. R. Eadie, C. H. Guise, W. J. Hamilton, Jr., O. H. Hewitt, P. P. Kellogg, R. R. Morrow, A. M. Phillips, Jr., E. C. Raney, C. G. Sibley, *G. A. Swanson,* D. A. Webster.

APPROVED MAJOR AND MINOR SUBJECTS

Fishery Biology 1, 2, 3, 4
Forest Conservation 3, 4
Oceanography 1, 2, 3, 4
Vertebrate Zoology 1, 2, 3, 4 (including herpetology, ichthyology, mammalogy, and ornithology)
Wildlife Management 1, 2, 3, 4

Language requirement for the Master's degree: college entrance French and/or German or an approved substitute.

To undertake graduate study the student should be well prepared in general and vertebrate zoology and should have or must acquire a foundation in the specialized field of study which he intends to pursue. A strong background in the other natural and physical sciences is highly desirable, and a working knowledge of statistical methods is important in all fields. Staff members are available to direct graduate study during the regular University Summer Session, and selected summer courses are offered.

Applicants for graduate study in conservation are expected to submit Graduate Record Examination scores for the aptitude and profile tests. Applicants whose cases must be considered before the Graduate Record Examination scores are available may be recommended for admission as noncandidates pending satisfactory scores in the Graduate Record Examination.

Members of the staff will be interested in directing research in the fields as listed: J. C. Ayers — oceanography and marine ecology; C. O. Berg — limnology; W. R. Eadie — mammalogy; C. H. Guise — forest conservation; W. J. Hamilton — mammalogy and herpetology; O. H. Hewitt — wildlife management; P. P. Kellogg — ornithology and biological acoustics; R. R. Morrow — forest conservation; A. M. Phillips — nutrition and physiology of fishes; E. C. Raney — ichthyology and management of coastal fisheries; C. G. Sibley — ornithology; G. A. Swanson — wildlife management; D. A. Webster — freshwater fisheries management.

Attention is also directed to the fields of study and courses offered in the Departments of Botany *(Ag.),* Zoology *(Arts),* and Entomology and Limnology *(Ag.).* Graduate study in conservation education is directed under Nature Study and Science Education *(Ed.).*

Preregistration is required for all courses in conservation.

DAIRY SCIENCE *(AG.)*

Professors J. M. Sherman, A. C. Dahlberg, *B. L. Herrington,* R. F. Holland, W. K. Jordan, F. V. Kosikowsky, V. N. Krukovsky, H. B. Naylor, W. F. Shipe, Jr., J. C. White.

APPROVED MAJOR AND MINOR SUBJECTS

Dairy Science 1, 2, 4
Dairy Chemistry 1, 2, 4

The research interests of the individual members of the staff are broad, but, in general, they may be indicated as follows: J. M. Sherman, bacteriology; A. C. Dahlberg, technology of milk products; B. L. Herrington, physicochemical studies of milk products; R. F. Holland, market milk and related products; W. K. Jordan, dairy engineering; ice cream, and concentrated milk products; F. V. Kosikowsky, biochem-

istry, bacteriology, and technology of dairy products; V. N. Krukovsky, biochemistry of milk and fat-containing food products, enzymes, vitamins, antioxidants and "off flavor" development; H. B. Naylor, dairy bacteriology; W. F. Shipe, Jr., enzymatic reactions in dairy products; J. C. White, sanitary and technical problems of milk and milk products.

Those intending to major in dairy science should have preparation in calculus; physics; bacteriology; qualitative, quantitative, and organic chemistry; as well as elementary courses in dairy industry.

Those intending to major in dairy chemistry should offer calculus; physics; qualitative, quantitative, organic, and physical chemistry. Training in dairy industry is desirable but not essential. Deficiency in any of the subjects listed is not necessarily a bar to admission, but it may increase the time needed to earn the degree.

In general, graduate students are expected to acquire a broad knowledge of the chemical, physical, and biological properties of milk and its products. However, mastery of the subject material and the acquisition of residence units alone are not sufficient to earn the degree. Candidates must show that they have matured as students, and that they are able to conduct independent and intensive study in the laboratory and in the library.

ENTOMOLOGY AND LIMNOLOGY *(AG.)*

Professors C. O. Berg, J. L. Brann, F. H. Butt, W. L. Coggshall, J. E. Dewey, Henry Dietrich, E. J. Dyce, H. E. Evans, J. G. Franclemont, G. G. Gyrisco, J. D. Hood, H. C. Huckett, A. A. LaPlante, R. W. Leiby, J. G. Matthysse, J. A. Naegele, *C. E. Palm*, R. L. Patton, W. A. Rawlins, H. H. Schwardt, B. V. Travis, L. D. Uhler, T. C. Watkins, and D. A. Webster. At Geneva: *Professors* J. A. Adams, P. J. Chapman, A. C. Davis, R. W. Dean, F. L. Gambrell, E. H. Glass, G. E. R. Hervey, S. E. Lienk, F G. Mundinger, E. H. Smith, K. G. Swenson, E. F. Taschenberg.

APPROVED MAJOR AND MINOR SUBJECTS

Apiculture 1, 2, 3, 4
Insect Ecology 1, 2, 3, 4
Economic Entomology 1, 2, 3, 4
Insect Morphology and Histology 1, 2, 3, 4
Insect Embryology 1, 2, 3, 4
Insect Taxonomy 1, 2, 3, 4
Insect Physiology 1, 2, 3, 4
Insect Toxicology 1, 2, 3, 4
Insecticide Chemistry 1, 2, 3, 4
Medical Entomology I, 2, 3, 4
Parasitology 1, 2, 3, 4
Limnology 1, 2, 3, 4
Entomology 4

Language requirement for the Master's degree: proficiency in one language before the last term or exemption by the Special Committee.

To undertake graduate study the student should not only be prepared in the fundamentals of animal biology and related fields but also have or acquire a foundation in the particular phase of the subject which he intends to pursue. In the summer, members of the staff are prepared to direct the research of graduate students in connection with the Summer Session of Cornell University.

Special facilities for research include the Comstock Memorial Library of over 30,000 volumes and the Everett Franklin Phillips Beekeeping Library of more than 3,000 volumes, each supplemented by thousands of reprints; sets of practically every entomological serial ever published; an extensive insect collection of North American and exotic insects, mostly determined by specialists and especially rich in Lepidoptera, Hymenoptera, Coleoptera, Odonata, and many other orders; and an insectary for research on problems related to insect biology, ecology, toxicology, and the chemistry of insecticides.

FLORICULTURE AND ORNAMENTAL HORTICULTURE *(AG.)*

Professors R. C. Andreasen, J. F. Cornman, R. E. Lee, L. H. MacDaniels, K. Post, J. P. Porter, A. M. S. Pridham, W. E. Snyder.

APPROVED MAJOR AND MINOR SUBJECTS

Floriculture and Ornamental Horticulture: 1, 2, 4

Language requirement for the Master's degree: proficiency in one language, preferably German or French.

Members of the staff of this field are concerned with greenhouse crops, nursery crops, turf, plant materials, breeding of ornamental plants, and the problems of landscaping as applied to small properties.

Since many of the problems dealing with greenhouses and nursery crops, turf, and the breeding of ornamental plants are basically those of plant response with relation to the environment, it is expected that the entering graduate student will have adequate preparation in elementary horticulture, botany, plant physiology, genetics, pathology, agronomy, entomology, chemistry and physics. Studies relating to the propagation, nutrition, culture and improvement of ornamental plants may be undertaken as research for an advanced degree and should be approached from the standpoint of the basic sciences. Consequently it is appropriate to select minor fields of study from physiology, anatomy, morphology, taxonomy, pathology, genetics, agronomy, entomology, agricultural economics, agricultural engineering, etc.

Studies involving the use of plant materials and problems of design relating to landscape service for small properties may be suitable, in which case it is expected that the student will have an adequate background in the basic principles of horticulture and plant science as well as in design and drawing.

Graduate students interested in problems concerned with the revision of taxonomic groups of ornamental plants are referred to the section of this Announcement describing the facilities of the L. H. Bailey Hortorium (page 61).

FOOD AND NUTRITION *(H.E.)*

Professors A. M. Briant, F. Fenton, H. M. Hauck, F. A. Johnston, K. Longree, L. A. Maynard, C. M. McCay, C. J. Personius, B. F. Steele, G. Steininger, C. M. Young.

APPROVED MAJOR AND MINOR SUBJECTS

Food and Nutrition 1, 2, 4 Food 1, 2, 3, 4

Nutrition 1, 2, 3, 4

For students who wish to major or minor in the field of food and nutrition, a wide variety of offerings is available both as to course work and opportunities for independent study. Information concerning these offerings may be obtained by writing to the Graduate Faculty representative in the field of food and nutrition. No set program of study is prescribed for a major or minor in this field. The student's program is planned to give her a well-rounded knowledge of the subject, after consideration of her previous background and her purpose in graduate study.

Although the majority of students who undertake graduate work in this field have had basic courses in home economics, a student whose undergraduate major emphasis was in chemistry, biology, or the social sciences and who wishes to major or minor in the field of food and nutrition may be accepted. Such a student is expected to gain an appreciation of the broad field of home economics during the course of her graduate study.

For graduate work, in addition to basic courses in food and nutrition, an elemen-

tary knowledge of physiology and biochemistry is required. While the essential background varies with the student's purpose, a knowledge of quantitative analysis, biology, bacteriology, physics, mathematics, statistics, and the social sciences is desirable. Study in these related fields may be undertaken by the student during the course of her graduate work. Students whose preparation is deficient may be required to make up the deficiency by a period of study as a noncandidate, with an adviser in the field of food and nutrition.

Members of the staff will direct research in the following areas: Professor Briant, in the properties of foods in relation to home preparation, processing and nutritive value of flour and starch products; Professor Fenton in the properties of foods in relation to home preparation, processing and nutritive value of vegetables, meats, and fruits; Professor Personius, experimental studies on food; Professor Longree, experimental studies on food prepared in quantity; Professors Johnston and Steele, experimental studies in human nutrition; Professor McCay, nutrition studies involving the use of small animals; Professors Hauck and Steininger, studies involving research on topics relating to human nutrition.

GENERAL BIOLOGY *(AG.)*

Professors J. D. Hood and *L. D. Uhler.*

APPROVED MAJOR AND MINOR SUBJECT

General Biology 2, 4

The M.S. degree in general biology is offered especially for those students who are graduates of small colleges, whose subject matter in the biological sciences is limited, and who plan to teach in small colleges or high schools. It is not offered for those students who plan to do research in a subject matter field of the biological sciences except as a minor to round out their background.

PLANT BREEDING *(AG.)*

Professors S. S. Atwood, H. L. Everett, W. T. Federer, N. F. Jensen, A. A. Johnson, J. R. Livermore, C. C. Lowe, H. M. Munger, *R. P. Murphy,* H. H. Smith, A. M. Srb, R. G. D. Steel, R G. Wiggans, T. L. York. At Geneva: *Professors* J. D. Atkin, D. W. Barton, J. Einset, G. L. Slate.

APPROVED MAJOR AND MINOR SUBJECTS

Plant Breeding 1, 2, 3,* 4 Biometry and Statistics 3, 4

Genetics 1, 2, 3,* 4

Language requirement for the Master's degree: proficiency in one language, before completion of second residence unit, or substitute approved by the Field.

Students who are interested in crop improvement through breeding will register in *plant breeding.* Problems for research may involve studies of breeding technics, the application of genetic principles to breeding, and the correlation of knowledge from other fields in attacks on problems such as yield, quality, adaptability, and disease and insect resistance. The department now has active research projects with most of the important field and vegetable crops of New York, and certain materials from these are available for graduate student problems. Those students interested in theoretical phases will register in *genetics,* and their research problems generally will deal with genic and chromosomal analyses of hereditary and evolutionary phenomena. Almost any suitable biological materials can be utilized, but the most readily available ones will be those currently being studied by the departmental staff in genetic investigations. For those students to whom problems of experimental

*Not approved as minor subject when major is in genetics or plant breeding.

technic and mathematical analysis of biological data hold the greater appeal, registration will be in *biometry and statistics.*

It is advisable that the student entering upon graduate work be well grounded in the fundamentals of the natural sciences. He should have had elementary courses in inorganic and organic chemistry, college algebra, botany or zoology or biology, and plant, animal, or human physiology. Students intending to specialize in biological statistics will find it to their advantage to have additional training in mathematics. Broad training and experience in the field of agriculture are essential for those planning to major in the field of plant breeding.

Students majoring in plant breeding or genetics will find it necessary to remain in Ithaca during the summer, or to make satisfactory arrangements for growing and studying elsewhere the material used in connection with their research problems.

Members of the staff will be especially interested in directing research in the field as listed, although research will not be limited to these fields: Professor Atwood, forage crops—cytogenetics; Professor Murphy, forage crops—genetics and breeding; Professor Lowe, forage crops—breeding; Professor Jensen, cereal grains—genetics and breeding; Professors Munger and York, vegetable crops—genetics and breeding; Professor Livermore, potato breeding; Professor Everett, corn genetics and breeding; Professor Wiggans, corn breeding; Professor Johnson, extension and seed programs; Professor Smith—plant genetics and evolution; Professor Srb, biochemical genetics; Professor Federer, biological statistics and design of experiments; and Professor Steel, biological statistics and multivariate analysis. Prospective students will find it to their advantage to correspond with the staff member whose interests are most closely related to their own some months in advance of the time they wish to enter, since only a limited number of students can be accommodated.

PLANT PATHOLOGY *(AG.)*

Professors C. W. Boothroyd, W. H. Burkholder, A. B. Burrell, C. Chupp, A. W. Dimock, K. H. Fernow, *G. C. Kent,* R. P. Korf, W. F. Mai, L. M. Massey, W. D. Mills, A. G. Newhall, K. G. Parker, L. C. Peterson, D. A. Roberts, A. F. Ross, L. J. Tyler, D. S. Welch, R. E. Wilkinson. At Geneva: *Professors* A. J. Braun, R. M. Gilmer, J. M. Hamilton, J. J. Natti, D. H. Palmiter, W. T. Schroeder, M. Szkolnik.

APPROVED MAJOR AND MINOR SUBJECTS

(The Faculty usually does not advise a minor in one of these subjects when the major is in the other.)

Mycology 1, 2, 3, 4 Plant Pathology 1, 2, 3, 4

Language requirements for Master's degree: proficiency in French or German before second term.

Majors in plant pathology are expected to become familiar with the principles underlying the initiation of infection by the major groups of plant pathogens, the course of infection, the relation of environment to disease, the principles and methods of disease control, and the interrelation of pathogen and suscept. The student must become familiar with the various techniques useful in studying the details of the diseases and of their control. Individual research will be carried on in one area of the field. Students should spend their summers in field work under professors' direction in order to come into contact with diseases under natural conditions and the practical aspects of control. They should have some practice in teaching. Candidates should have a knowledge of elementary physics, inorganic chemistry, organic chemistry, general botany, plant histology and anatomy, and plant physiology. Op-

portunity is afforded for further study in these fields, but students with deficiencies cannot expect to complete the degree in the minimum amount of residence.

Majors in mycology are expected to become familiar with the broad field of mycology, including morphology, taxonomy, physiology, genetics, and cytology. It is expected that the student will become proficient in the various techniques used in the study of fungi. Individual research will be concentrated in one phase of the field. Students will profit by spending their summers in the field, collecting and examining fungi in the fresh state. Candidates should possess a thorough grounding in general botany. Opportunity is afforded for further study in related fields, such as taxonomic botany, morphology and anatomy, microtechnique, plant physiology, biochemistry, genetics, and cytology.

A limited number of assistantships providing opportunities for research and teaching are available in the department.

POMOLOGY *(AG.)*

Professors D. Boynton, L. J. Edgerton, E. G. Fisher, A. J. Heinicke, M. B. Hoffman, *R. M. Smock.* At Geneva: *Professors* J. C. Cain, O. F. Curtis, J. Einset, N. J. Shaulis, G. L. Slate, R. G. Way.

APPROVED MAJOR AND MINOR SUBJECTS

Pomology 1, 2, 4

Laboratory, greenhouse, orchard, and cold storage facilities at Ithaca and Geneva are available for graduate study. Special facilities for research in fruit breeding, nursery stock investigations, and other phases of pomology are also available at Geneva.

Minor subjects may be such as plant physiology, plant anatomy, cytology, soil chemistry, soil physics, biochemistry, and chemistry. One minor in botany, particularly plant physiology, is urged.

To enter upon graduate work, the student should have the equivalent of the following courses: general botany, elementary plant physiology, economic entomology, elementary plant pathology, introductory inorganic and elementary organic chemistry, elementary pomology, and systematic pomology.

Candidates for the Master's degree should spend one summer at Ithaca or Geneva or in the field investigating their special subject. At least two summers of work are expected of candidates for the doctorate.

POULTRY HUSBANDRY *(AG.)*

Professors J. H. Bruckner, R. K. Cole, G. O. Hall, G. F. Heuser, F. W. Hill, F. B. Hutt, S. C. King, L. C. Norris, A. L. Romanoff, M. L. Scott.

APPROVED MAJOR AND MINOR SUBJECTS

Animal Genetics 1, 2, 3, 4
Animal Nutrition 1, 2, 3, 4
Chemical Embryology 1, 2, 3, 4
Poultry Husbandry 2, 4

It is desirable that graduate students electing a major subject in these fields should have had some undergraduate training in poultry husbandry, some experience in that field, and courses in zoology or animal biology, physiology, physics, and chemistry. Other requirements will be specified by the major adviser.

It is recommended that those candidates for the Master's degree who expect to become candidates for the doctorate study one or more foreign languages.

For further information on animal genetics and animal nutrition see page 59.

PSYCHOLOGY *(ARTS)*

Professors G. W. Boguslavsky, U. Bronfenbrenner, R. H. Dalton, F. S. Freeman, J. J. Gibson, H. Harvey, J. E. Hochberg, W. W. Lambert, H. S. Liddell, R. B. MacLeod, K. C. Montgomery, *T. A. Ryan,* P. C. Smith, R. D. Walk, A. L. Winsor.

APPROVED MAJOR AND MINOR SUBJECTS

Comparative Psychology 1, 2, 3, 4
Differential Psychology and Psychological Tests 1, 2, 3, 4
Experimental Psychology 1, 2, 3, 4
Experimental Psychopathology 1, 2, 3, 4
General Psychology 2, 4
History of Psychology and Systematic Psychology 1, 2, 3, 4
Industrial Psychology 1, 2, 3, 4
Personality and Social Psychology 1, 2, 3, 4

Language requirement for the Master's degree: proficiency in French or German before the final examination.

The research laboratories of the Department of Psychology *(Arts)* are located in Morrill Hall and at the Cornell Behavior Farm. Additional research facilities are provided by the Department of Sociology and Anthropology *(Arts)*, the Department of Child Development and Family Relationships *(H.E.)*, the School of Education *(Ed.)*, and the School of Industrial and Labor Relations *(I.L.R.)*. Since much of the graduate instruction and research in psychology is conducted co-operatively, the prospective student should consult the Announcements of each of these departments.

STATISTICS *(AG., ARTS, ENG., I.L.R.)*

(See page 55.)

VEGETABLE CROPS *(AG.)*

Professors H. J. Carew, A. R. Hamson, *J. D. Hartman,* F. M. R. Isenberg, W. C. Jacob, W. C. Kelly, M. W. Meadows, H. M. Munger, A. J. Pratt, G. J. Raleigh, Ora Smith, R. D. Sweet, and T. L. York. At Geneva: *Professors* D. W. Barton, J. D. Adkin, C. B. Sayre, W. T. Tapley, M. T. Vittum.

APPROVED MAJOR AND MINOR SUBJECTS

Vegetable Crops 1, 2, 4

Research and study in vegetable crops involve the application of fundamental scientific knowledge and methods to the solution of the problems of production and handling in the vegetable industry. These problems include control of flowering and fruiting, use of organic chemical growth regulators, determinations of fertilizer and irrigation requirements, adaptation of rapid tests for diagnosing nutrient deficiencies, development of objective methods for the determination of edible and market quality, physiological effects of various methods of harvesting, shipping, packaging, storing, and merchandising vegetables, control of physiological diseases, use of herbicides, and the like.

To enter upon graduate work in this field the student should have the equivalents of the following courses: Botany 1 and 31, Plant Pathology 1, Entomology 12, Agronomy 1, and Vegetable Crops 1 *(Ag.)*. In case a student has not had the equivalent of any one of these courses, he should take it in the first year of his graduate study. Basic training in quantitative analysis, organic chemistry, physics, and mathematics through analytical geometry or calculus is highly desirable.

Students taking either a major or a minor are required to take Vegetable Crops 2, 101, 112, 113, and 225 *(Ag.)* and to attend the department seminar except in semes-

ters when the seminar conflicts with another required course. Course work in other departments is regularly required as a part of a major program in vegetable crops.

VETERINARY MEDICINE *(VET.)*

Professors D. W. Baker, J. A. Baker, J. Bentinck-Smith, D. W. Bruner, A. G. Danks, D. D. Delahanty, R. W. Dougherty, H. H. Dukes, J. A. Dye, H. E. Evans, Julius Fabricant, M. G. Fincher, F. H. Fox, J. H. Gillespie, H. L. Gilman, R. E. Habel, *W. A. Hagan,* M. R. Kare, E. P. Leonard, P. P. Levine, K. McEntee, M. E. Miller, J. M. Murphy, L. L. Nangeroni, P. Olafson, M. C. Peckham, C. G. Rickard, S. J. Roberts, J. H. Whitlock.

APPROVED MAJOR AND MINOR SUBJECTS

Veterinary Anatomy 1, 2, 3, 4
Animal Physiology 1, 2, 3, 4
Veterinary Pathology 1, 2, 3, 4
Pathogenic Bacteriology 1, 2, 3, 4
Veterinary Virology 1, 2, 3, 4
Parasitology 1, 2, 3, 4
Veterinary Medicine 1, 2, 3, 4
Veterinary Obstetrics and Diseases of the Reproductive Organs 1, 2, 3, 4
Veterinary Surgery 1, 2, 3, 4

For candidates for the Master's degree a reading knowledge of German and French or Spanish is very desirable but not required.

ZOOLOGY *(ARTS)*

Professors H. B. Adelmann, J. M. Anderson, L. C. Cole, P. W. Gilbert, S. L. Leonard, H. A. Schneiderman, M. J. Singer, and W. A. Wimsatt.

APPROVED MAJOR AND MINOR SUBJECTS

Comparative Anatomy 1, 2, 3, 4
Comparative and Cellular Physiology 1, 2, 3, 4
Comparative Neurology 1, 2, 3, 4
Ecology 1, 2, 3, 4
Endocrinology 1, 2, 3, 4
Histology and Embryology 1, 2, 3, 4
Invertebrate Zoology 1, 2, 3, 4

Language requirement for the Master's degree: proficiency in German or French.

The Department of Zoology offers excellent opportunities for graduate study and research in all phases of zoology, but particularly in the descriptive and experimental aspects of the following special fields: (1) Comparative and Human Anatomy, with emphasis on the functional approach; (2) Comparative and Cellular Physiology; (3) General Ecology; (4) Endocrinology; (5) Histology and Embryology; (6) Invertebrate Zoology; and (7) Comparative and General Neurology. Members of the staff are especially qualified to direct research in the special fields listed, but research need not be limited to these fields. The research interests of the members of the staff are broad, but, in general, they may be summarized as follows: H. B. Adelmann, experimental embryology and the history of embryology; J. M. Anderson, general and comparative anatomy of invertebrates, with emphasis on the functional histology and histochemistry of organ systems; L. C. Cole, general ecology with special emphasis on population phenomena and the mathematical theory of populations; P. W. Gilbert, vertebrate functional anatomy, i.e., correlation of habits and activities of vertebrates with their morphology, origin and evolution of the vertebrate extrinsic ocular muscles; S. L. Leonard, general endocrinology with special emphasis on the anatomical, physiological, and biochemical aspects of the mechanisms of hormone action, reproduction, growth and metabolism; H. A. Schneiderman, cellular and comparative physiology, metamorphosis, respiration, and intermediary metabo-

lism of insects, tissue culture, oxidative enzymes, physiological and biochemical effects of radiation; M. J. Singer, general and comparative neurology, experimental morphology, problems of growth and regeneration, and the physical chemistry of dye and protein interactions; W. A. Wimsatt, histology, histophysiological and histochemical approach to problems of reproduction, comparative placentation, and hibernation.

Applicants for graduate study in zoology must take the Graduate Record Examination Aptitude and Profile Tests in sufficient time to permit consideration of the results along with the application for admission into the Graduate School.

All applicants should have completed the equivalent of a well-rounded college major in zoology, and should have some foundation in the particular phase of zoology it is desired to pursue. Courses in Organic Chemistry and Elementary Physics should also have been completed. Although an exceptional student may be admitted without having completed the above requirements, he should then expect to remain in residence beyond the minimum period to make up the deficiencies.

In addition to the courses offered by the Department of Zoology *(Arts)*, other courses of study that are often valuable to graduate students (either as individual courses or as minor subjects) are: chemistry (especially organic and physical chemistry), geology, mathematics, psychology and physics *(Arts);* bacteriology, biochemistry, botany, conservation, entomology, genetics (Department of Plant Breeding), and physiology of reproduction (Department of Animal Husbandry) *(Ag.);* and physiology *(Vet.)*.

Physical Sciences

AERONAUTICAL ENGINEERING *(ENGIN.)*

Professors A. R. KANTROWITZ, Y. H. KUO, C. RIPARBELLI, N. ROTT, *W. R. Sears.*

APPROVED MAJOR AND MINOR SUBJECTS

Aeronautical Engineering 1, 3, 4 Aerodynamics 4

In this field of graduate study emphasis is placed on the aeronautical sciences rather than mere proficiency in present-day techniques. Consequently, graduate students having aeronautical engineering as their major subject will be urged to select as their minor subjects the basic sciences, such as mathematics, physics, and mechanics.

Much of the research carried out in this field at Cornell is concerned with fundamental problems in the dynamics of fluids. Whenever possible, these investigations combine the techniques of theory and laboratory experiment, making use of the experimental facilities of the Graduate School of Aeronautical Engineering, on the campus. In every investigation, an attempt is made to correlate theory with observation and practical experience.

A group working under the direction of Professor Kantrowitz is investigating the dynamics of gases at extreme temperatures. Generally speaking, their interests lie in matters in which the phenomena of atomic physics are finding application to the aerodynamics of propulsion systems and of flight at extreme speeds. This brings the group into close contact with several other departments in the University. Another group, which includes Professors Kuo, Rott, and Sears, is carrying out research on subjects basic to modern wing theory and power plant theory. These include investigations of the turbulent boundary layer and of three-dimensional boundary-layer problems in general. Other investigations typical of the group's activities are shock-boundary-layer interaction and unsteady flow about wings and rotating compressors. Under Professor Riparbelli's direction, research is being pursued in the general field of structural dynamics, with special emphasis on transient stress propagation, especially in the plastic regime. These investigations are both theoretical and experimental.

Candidates for the Ph.D. with a major in this field who do not already hold the Master's degree will be encouraged to matriculate first as candidates for the professional degree, M.Aero.E., under the jurisdiction of the Graduate School of Aeronautical Engineering. Information concerning this School and the degree M.Aero.E. will be found in the *Announcement of the College of Engineering.*

ASTRONOMY *(ARTS)*

Professors M. S. CARPENTER, *R. W. Shaw.*

APPROVED MAJOR AND MINOR SUBJECTS

Astronomy 1, 2, 4 Astrophysics 1, 2, 4

Language requirement for the Master's degree: proficiency in French or German.

Applicants for admission are required to offer the equivalent of introductory astronomy, six hours of interpretational astronomy, six hours of electives in the Field of Astronomy, and evidence of the completion of sufficient work in physics and mathematics to assure the successful pursuance of advanced work in astronomy.

Candidates for the degree of Doctor of Philosophy with a major in astronomy or astrophysics are required to take one minor in physics unless a divided major is granted. In special cases a major in astronomy or astrophysics may consist partly of selected courses in physics. In such cases one minor need not be in physics.

Candidates electing a minor in the Field may select such courses as meet their requirements, provided the necessary prerequisites are offered.

Students with advanced standing in the sciences or in mathematics who do not desire to major or minor in astronomy may be admitted after consultation with the professor in charge to such courses in astronomy as seem desirable.

CHEMICAL ENGINEERING *(ENGIN.)*

Professors P. Harriott, J. E. Hedrick, C. W. Mason, F. H. Rhodes, J. C. Smith, R. L. Von Berg, H. F. Wiegandt, *C. C. Winding.*

APPROVED MAJOR AND MINOR SUBJECTS

Chemical Engineering 1, 2, 4

To qualify for admission, a student must have completed satisfactorily a course substantially equivalent in its technical content to the course leading to the degree of Bachelor of Chemical Engineering at Cornell University. Exact equivalency, subject for subject and credit hour for credit hour, is neither required nor expected, but the previous training must be such as to prepare the applicant for effective work in chemical engineering at the graduate level.

However, for candidates centering their instruction and research in chemical microscopy, undergraduate training in chemical engineering is not required.

Minor subjects may be chosen, for example, from metallurgical engineering or other divisions of engineering, chemistry, physics, mathematics, business and public administration, or industrial and labor relations.

Candidates are expected to pursue a course of study that will give them a deeper comprehension of the basic and applied sciences and will develop initiative, originality, and creative ability. Graduate courses are offered in thermodynamics, reaction kinetics, economics, statistics, the unit operations of chemical engineering, and petroleum refining, and in the chemistry and technology of rubbers and plastics. Specific programs are planned to fit the objectives of the student and to develop original thinking. The student is not required to take an arbitrarily fixed series of courses.

Research work for the thesis may be in the specific fields of unit operations, thermodynamics, reaction kinetics, chemical processes, design, chemical engineering economics, petroleum processes, rubber, or plastics.

CHEMISTY *(ARTS)*

Professors S. H. Bauer, R. Bersohn, A. T. Blomquist, W. D. Cooke, Peter Debye, P. J. Flory, R. M. Hexter, J. L. Hoard, J. P. Hunt, J. R. Johnson, A. W. Laubengayer, F. A. Long, J. Meinwald, *W. T. Miller,* M. L. Nichols, R. K. Osterheld, D. D. Phillips, R. A. Plane, H. A. Scheraga, M, J. Sienko.

APPROVED MAJOR AND MINOR SUBJECTS

Inorganic Chemistry 1, 2, 3, 4	Organic Chemistry 1, 2, 3, 4
Analytical Chemistry 1, 2, 3, 4	Physical Chemistry 1, 2, 3, 4

Language requirement for the Master's degree: proficiency in French or German or an approved substitute.

The program of graduate study in chemistry is designed to give a broad training in the fundamental knowledge of chemistry and in methods of research. A graduate student will ordinarily pursue these objectives by taking advanced courses, by participation in organized and informal seminars and discussions with his associates and Faculty members, and by carrying out and reporting on a research project in his major field. Upon completion of their study program, graduates normally go out to positions in research laboratories or to positions involving teaching and research.

Candidates for the degree of Master of Arts, Master of Science, or Doctor of Philosophy with major in chemistry will be expected to offer for admission the equivalent of an A.B. degree with a major in chemistry. Such training should include courses in general chemistry, qualitative and quantitative analysis, organic chemistry, physical chemistry, and mathematics and physics. Some experience with foreign languages, preferably German and either French or Russian, is also regarded as essential. In admitting students emphasis is placed on quality of performance and promise for research as judged by those best acquainted with applicants. Unusually promising students may be admitted with deficiencies in undergraduate training. In such cases work designed to make up the deficiencies will be required and more than the usual period of residence may be necessary.

Proficiency tests will be required of all entering candidates for advanced degrees (M.S. or Ph.D.) with a major in chemistry. These tests are given a few days before registration for the fall term and cover the divisions of inorganic, analytical, organic, and physical chemistry. Each test will be about two and one-half hours in length and will cover material normally presented in elementary courses in the subjects listed above. The results of these tests will be used to aid the student's Special Committee in the selection of his program of courses. While the results will not be considered in the usual sense of "passing" or "failing," low marks in one or more of the tests may require a preponderance of elementary courses during a term and reduced residence units for that term.

Graduate students are required to register with the Department of Chemistry on the registration days at the beginning of each term. Entering students will consult with the chairman of the departmental Graduate Scholarship Committee at this time.

In addition to the courses in chemistry *(Arts)*, attention is directed to courses in chemical engineering, including chemical microscopy *(Engin.)*, and to work in biochemistry, offered in the School of Nutrition.

A graduate student who desires to take a minor subject in chemistry, with some field other than chemistry as the major subject, will generally be required to offer introductory courses in inorganic chemistry, qualitative and quantitative analysis, and organic chemistry as preliminary to his graduate study. The work upon his minor subject in chemistry may be taken in any branch of the subject that he is qualified to pursue and comprises advanced courses selected with the approval of his Special Committee.

Specific inquiries from prospective graduate students are welcomed and should be addressed to the representative or to a member of the Faculty in the branch of chemistry in which major work is contemplated. Applications for teaching or research assistantships should be addressed to the chairman of the Department of Chemistry, Baker Laboratory.

CIVIL ENGINEERING *(ENGIN.)*

Professors D. J. Belcher, P. P. Bijlaard, M. Bogema, *N. A. Christensen*, C. Crandall, G. P. Fisher, C. D. Gates, J. C. Gebhard, H. M. Gifft, B. K. Hough, H. T. Jenkins, A. L. Jorissen, T. D. Lewis, W. O. Lynch, G. B. Lyon, W. McGuire, A. J. McNair, M. S. Priest, L. Reid, F. J. Spry, R. Y. Thatcher, G. Winter.

APPROVED MAJOR AND MINOR SUBJECTS

Drawing and Cartography 4
Geodetic and Photogrammetric Engineering 1, 2, 4
Hydraulics 1, 2, 3, 4
Hydraulic Engineering 1, 2, 3, 4
Management Engineering 1, 2, 3, 4
Sanitary Engineering 1, 2, 4
Sanitary Sciences 3, 4
Structural Engineering 1, 2, 3, 4
Soils Engineering 1, 2, 3, 4
Transportation Engineering 1, 2, 3, 4
Aerial Photographic Studies 2, 3, 4

To be admitted for graduate study in any of the fields of civil engineering, an applicant should ordinarily hold a Bachelor's degree in civil engineering from a school of recognized standing. However, arrangements may be made for exceptional cases when a student with undergraduate training in a different field, such as another branch of engineering, architecture, or the physical sciences, wishes to pursue graduate work in civil engineering. In such cases, additional residence may be required by the candidate's Special Committee. To be admitted the applicant must have been in at least the upper half of his class, or he must present other evidence which demonstrates his fitness to carry on graduate work.

The aim of graduate work in the studies grouped under civil engineering is not only to increase the student's proficiency in the more advanced phases of professional practice, but also to promote a deeper and broader understanding of the theoretical and empirical basis of the field, including in many cases the boundaries of present knowledge.

In addition to formal courses, individual work under personal direction by members of the staff is available.

Drawing and Cartography. The Department offers advanced drawing courses which may be adjusted to the needs of a particular student. Cartography and map reproduction are closely allied with the mapping requirements of topographers, geologists, and social scientists.

Geodetic and Photogrammetric Engineering. The Geodetic and Photogrammetric Engineering Department offers a considerable number of advanced courses in topographic engineering, geodesy and geodetic engineering, and photogrammetry and photogrammetric engineering. In addition, courses in related fields with special application to surveying problems are available in other departments of the University. Attention is directed to courses in astronomy, physics (optics and photography), mathematics, and geology *(Arts)*, and in regional and city planning *(Arch.)*

Hydraulics and Hydraulic Engineering. The Department of Hydraulics and Hydraulic Engineering offers a complete sequence of advanced courses in theoretical and experimental hydraulics, covering the subjects of hydrodynamics, advanced hydraulics, flow in open channels, hydraulic measurements, hydraulic models, pumps and turbines. Courses listed in hydraulic engineering deal with hydraulic structures, water power, flood control, erosion and sedimentation, rivers and harbors. Formal teaching is supplemented by informal discussions, demonstrations, laboratory experiments, and field trips. Seminars are held regularly with the participation of the staff, of graduate students, and of distinguished visitors.

In the Hydraulic Laboratory facilities are available for research and thesis work. Not infrequently, graduate students find part-time employment on laboratory projects. The Elon Huntington Hooker Fellowship in Hydraulics is available for research in this field. Graduate students may broaden their education by work in the allied fields of structural engineering, soils engineering, mechanical engineering, aeronautical engineering, mathematics, etc.

Management Engineering. Graduate study in management is intended to supple-

ment the civil engineer's basic technical training with advanced studies in principles of management, economics, finance, and business law. These types of study are of importance in such work as public administration, regional planning, city management, public housing, and valuation, as well as for the efficient and successful management of industry, construction contracting, and other lines of business with which the engineer may be connected.

SANITARY ENGINEERING. The Department offers a number of formal advanced courses in water supply, sewerage, industrial wastes, public health, sanitary biology, and chemistry in addition to supervision of informal courses in design and subjects of interest to special students. For the engineering student interested in the contributing sciences, minor work is available both in chemistry, bacteriology, biology, and fluid mechanics. Special programs are arranged for students majoring in such subjects as conservation, medical entomology, nutrition, hydraulics, and chemical and other engineering fields.

STRUCTURAL ENGINEERING AND SOILS ENGINEERING. The Department of Structural and Soils Engineering offers a considerable number of advanced courses in the field of structural analysis and design, and in soils and foundation engineering. In addition, courses in the fields of elasticity, stability, plasticity, applied mathematics, engineering materials, and other subjects are available in the Department of Mechanics and Engineering Materials *(Engin.)* and in the Department of Mathematics *(Arts)*. Courses on airplane structures are available in the Graduate School of Aeronautical Engineering. Courses in soils engineering may be supplemented by instruction in closely allied subjects such as Transportation *(Engin.)*, Geology *(Arts)*, and Agronomy *(Ag.)*.

Experimental facilities include testing machines up to 400,000-pound capacity with height up to 20 feet, strain gage equipment of all current types, and special laboratories for structural model analysis and soil mechanics.

The Department regularly employs graduate students for assistance in theoretical and experimental work on research projects sponsored by government and private agencies.

TRANSPORTATION ENGINEERING. Four courses in highway engineering, two in traffic engineering, two in railroad engineering, and one in airport engineering, constitute the formal offerings. The staff also offers four courses in various branches of aerial photographic studies, including engineering soil survey, construction planning, ground water, agricultural surveys for irrigation in arid areas, and advanced work in mineral surveys. Important courses in related fields commonly include agricultural soils *(Ag.)*, geology *(Arts)*, regional planning *(Arch.)*, statistics *(Arts, Engin.)* and transportation economics *(Engin.)*

Laboratories are available for graduate study and research in bituminous materials, aggregates, soils, and cements. Laboratory and field facilities in traffic engineering and aerial photographic studies are fully developed. Considerable emphasis is placed upon field work, and opportunities for practical experience are available in every phase of transportation. Part of the programs of students on leave from professional assignments may be adjusted to their special interests and research problems.

ELECTRICAL ENGINEERING *(ENGIN.)*

Professors P. D. ANKRUM, H. G. BOOKER, N. H. BRYANT, L. A. BURCKMYER, C. R. BURROWS, W. W. COTNER, C. L. COTTRELL, *A. B. Credle*, A. E. DAVIES, S. C. DWU, W. H. ERICKSON, W. E. GORDON, C. E. INGALLS, W. R. JONES, S. LINKE, M. G. MALTI, H. S. MCGAUGHAN, M. S. MCILROY, T. MCLEAN, W. E. MESERVE, B. NICHOLS, B. K. NORTHRUP, R. E. OSBORN, J. L. ROSSON, H. G. SMITH, E. M. STRONG, N. M. VRANA, R. D. WILSON, S. W. ZIMMERMAN.

APPROVED MAJOR AND MINOR SUBJECTS

Power Engineering 1, 2, 3, 4

Control Systems Engineering 1, 2, 3, 4

Communication Engineering 1, 2, 3, 4

Illuminating Engineering 2, 3, 4

Electrical Engineering General 1, 2, 3, 4

As prerequisite for graduate work leading to the degree of M.S. or Ph.D. with major in the field of electrical engineering, the candidate should have had the equivalent of the fundamental work required by an accredited undergraduate curriculum in the area of his major subject. The candidate must also supply definite evidence of scholarly interest and aptitude for advanced study. Though the Graduate Record Examination is not required of applicants in the field of electrical engineering, applicants may well consider taking this examination, submitting its results along with their application for graduate work.

Considerable latitude is allowed in the selection of the minor subjects, provided that the entire program shows a unified purpose.

Adequate work in advanced physics and mathematics is required of candidates for the degree of Ph.D. It is highly recommended that at least one of the two minor subjects be chosen in the fields of physics or mathematics or in other related fields outside the field of electrical engineering.

The approved major and minor subjects listed above, define broad areas in the field of Electrical Engineering within which a student may plan a graduate program which best suits his needs. In addition to the formal courses listed in the *Announcement of the College of Engineering* members of the faculty are prepared to guide individual students in special topics and to arrange seminars for students interested in closely related lines of study and research. Proficiency is expected in all phases of the graduate program.

A graduate student is expected to be capable of advanced study and research within the broad area of the approved major or minor subject which he selects. To define these areas more clearly, there are listed below the major topics included in each:

Power Engineering: Transmission and Distribution of Energy, System Stability, Economics of Utilities, High-Voltage Engineering, Power Generation, Relaying and Control, Electrical Machinery.

Control Systems Engineering: Electrical Machinery, Industrial Control and Applications, Industrial Electronics, Servomechanisms.

Communication Engineering: Communication Systems, Electron Tubes, Microwave Engineering, Radio Wave Propagation, Information Theory, Acoustical Engineering.

Illuminating Engineering: Light Sources, Illumination Design, Vision and Color, Optics, Instrumentation and Measurements.

Electrical Engineering General: Electric Circuit Analysis, Electrical Measurements, Materials in Electrical Engineering, Applied Mathematics.

It is not desirable, nor is it intended, that the boundaries between these areas within the field of Electrical Engineering be too clearly defined. Rather, every effort is made to allow each student to pursue a program designed to give him a period of broad advanced study. To this end work in such subjects as thermodynamics, fluid mechanics, engineering materials, or engineering physics, to name a few, may be considered as partially fulfilling the requirements for a major or minor in electrical engineering even though these subjects are not under the direct jurisdiction of the Faculty of the School of Electrical Engineering.

ENGINEERING MATERIALS *(ENGIN.)*

Professors D. F. Gunder, J. O. Jeffrey, J. R. Moynihan, H. S. Sack, F. O. Slate, D. A. Stuart.

APPROVED MAJOR AND MINOR SUBJECTS

Materials of Engineering 1, 2, 3, 4

Engineering materials includes both theoretical and experimental procedures for evaluating the properties of engineering materials. All graduate students are urged to acquire fundamental training in both of these phases. In addition to the courses of the department, many other courses in mechanics and metallurgy *(Engin.)* and physics *(Arts)* should be considered as appropriate and necessary supplements in an adequate training in the field of materials engineering. Laboratory facilities are available for investigations in metals, concrete, cement, concrete aggregate, timber, plastics, fuels, lubricants, and miscellaneous materials.

ENGINEERING MECHANICS *(ENGIN.)*

Professors H. D. Conway, E. T. Cranch, T. R. Cuykendall, J. A. Fay, *D. F. Gunder,* E. V. Howell, H. C. Perkins, L. Steg.

APPROVED MAJOR AND MINOR SUBJECTS

Mechanics 1, 2, 3, 4 Fluid Mechanics 1, 2, 3, 4

Graduate study in mechanics serves a twofold purpose. It trains men who intend to teach or to specialize in industrial research. The Faculty believes that both these groups are best served by a broad fundamental training. Although the work in this department is devoted primarily to the mechanics of particles and rigid bodies and of deformable solids, all students are encouraged to take work also in the fields of the mechanics of liquids and gases and in the related fields of materials, physics, and mathematics. Opportunity is provided for graduate students interested in teaching to participate in the teaching program in the University. Opportunity is likewise provided for those primarily interested in industrial research to participate in projects in this field. Candidates planning to complete a Master's degree in one year must have had advanced strength of materials (Engineering 1154) and applied mechanics (Engineering 1155) or the equivalent upon entering.

ENGINEERING PHYSICS *(ENGIN.)*

Profesors H. G. Booker, C. R. Burrows, D. R. Corson, A. B. Credle, T. R. Cuykendall, C. E. Grantham, D. F. Gunder, P. L. Hartman, M. Kac, A. R. Kantrowitz, H. S. Sack, W. R. Sears, B. M. Siegel, *L. P. Smith.*

APPROVED MAJOR AND MINOR SUBJECTS

Engineering Physics 1, 2, 4

The objective of graduate instruction in engineering physics is to offer concentrated study in a field which crosses conventional subject matter boundaries as well as to deepen and enlarge both the general scientific and the engineering background of the student. For this reason, the minor subject or subjects must be outside the field of his major subject and approved by the chairman of the Special Committee.

Though engineering physics undergraduate work is the preferred preparation for graduate work in engineering physics, students with a conventional physics or engineering background are readily accepted. Candidates for a Ph.D. in this field who do not already hold a Master's degree will be requested to matriculate first as candidates for a Master's degree; when they have become better acquainted with the work

and the requirements in this field, they may, on the recommendation of their Special Committee, change to Ph.D. candidacy without incurring loss of time.

Course work will be chosen principally from the courses offered in the College of Engineering and in the College of Arts and Sciences (Departments of Physics, Chemistry, Mathematics, etc.). The thesis can be done in any field represented by members of the Engineering Physics Faculty, or, if the candidate's Special Committee approves, in other fields in which engineering physics may be significant.

The members of the department are interested in a wide variety of research problems and the student will therefore find advice and special equipment available in many fields. In the electron microscopy laboratory, under the direction of Professor Siegel, research is conducted on the development of electron microscopy and electron diffraction techniques and their applications to problems in solid state and surface physics. Professors Cuykendall and Sack are interested in the study of the anelastic and plastic properties of solids (metals, ionic crystals, and plastics) and specialized equipment for growing single crystals and for studying their properties at high temperatures is available. Professors Smith, Hartman, and Sack conduct research on electronic properties of semiconductors and insulators, by means of measurements of luminesence, photoconductivity, dielectric properties, etc.; this research is in close connection with similar work going on in the Department of Physics. While the work just mentioned is supported by funds from, or by contracts with the Department of Engineering Physics, the student may avail himself of research possibilities in other departments through the affiliation of Engineering Physics staff members with these departments. (Professors Smith, Grantham, and Hartman, Department of Physics; Professor Corson, Laboratory of Nuclear Studies; Professor Booker, Burrows, and Credle, School of Electrical Engineering; Professors Kantrowitz and Sears, School of Aeronautical Engineering; Professor Gunder, Department of Engineering Mechanics; Professor Kac, Department of Mathematics). For the areas of interest of these members, and the facilities available, the student is referred to the announcements of these departments in this publication.

GEOLOGY AND GEOGRAPHY *(ARTS)*

Professors A. L. Anderson, J. D. Burfoot, Jr., *W. S. Cole,* W. T. Holser, C. M. Nevin, J. W. Wells.

APPROVED MAJOR AND MINOR SUBJECTS

Economic Geology 1, 2, 3, 4

Geography 1, 2, 3, 4

Geomorphology 1, 2, 3, 4

Mineralogy and Petrology 1, 2, 3, 4

Paleontology and Stratigraphy 1, 2, 3, 4

Structural Geology and Sedimentation 1, 2, 3, 4

Language requirement for the Master's degree: proficiency in French or German or an approved substitute.

Applicants for graduate study in geology must take the Graduate Record Examination Aptitude Test in sufficient time to permit consideration of the results along with the application for admission to the Graduate School.

Graduate work in geology may include investigation, under approved direction, in the field away from Ithaca.

MATHEMATICS *(ARTS)*

Professors R. P. Agnew, W. H. J. Fuchs, G. A. Hunt, W. A. Hurwitz, M. Kac, J. Kiefer, P. Olum, H. Pollard, J. B. Rosser, A. S. Shapiro, *R. J. Walker,* J. Wolfowitz.

APPROVED MAJOR AND MINOR SUBJECTS

Algebra 1, 2, 3
Analysis 1, 2, 3
Geometry 1, 2, 3
Applied Mathematics 2, 3
Mathematics 1, 2, 4

Language requirement for the Master's degree: proficiency in French or German or an approved substitute.

Prerequisites for candidacy are the equivalent of the elementary course in analytic geometry and calculus and further study in at least one more advanced subject, as, for example, differential equations, advanced calculus, modern algebra, or projective or advanced analytic geometry.

Candidates for the Master's degree are expected to attain some understanding of modern mathematical thought. Qualifications for the Doctor's degree include a broad acquaintance with the basic subjects of present-day mathematics plus a demonstration of ability to do research in one or more branches of mathematics. In addition to the more commonly recognized branches, the Department offers programs of advanced study and research in symbolic logic and in probability and statistics.

MECHANICAL ENGINEERING *(ENGIN.)*

Professors R. N. Allen, W. C. Andrae, T. J. Baird, R. E. Bechhofer, A. H. Burr, R. E. Clark, S. F. Cleary, B. J. Conta, D. Dropkin, G. B. DuBois, F. S. Erdman, H. N. Fairchild, N. R. Gay, R. L. Geer, G. F. Hanselman, I. Katz, *H. J. Loberg,* H. H. Mabie, C. O. Mackey, R. E. McGarrah, E. S. Monroe, F. Ocvirk, R. M. Phelan, M. W. Sampson, B. W. Saunders, A. Schultz, Jr., D. G. Shepherd, R. H. Siegfried, E. B. Watson, R. L. Wehe.

APPROVED MAJOR AND MINOR SUBJECTS

Administrative Engineering 1, 2, 3, 4
Automotive Engineering 1, 2, 4
Engineering Drawing 1, 2, 3, 4
Heat-Power Engineering 1, 2, 3, 4
Industrial Engineering 1, 2, 3, 4
Machine Design 1, 2, 3, 4
Materials Processing 1, 2, 3, 4
Applied Industrial Statistics 1, 2, 3, 4
Operations Research 1, 2, 3, 4

As prerequisite for graduate study in mechanical engineering, the student should have the equivalent of the courses in his major field that are required of undergraduates in mechanical engineering at Cornell. These courses are described in the *Announcement of the College of Engineering.* Those lacking the full equivalent of this training may be required to take one or more of these undergraduate courses or to do assigned work to make up the deficiency.

There are five departments in the Sibley School of Mechanical Engineering. Graduate work is not confined to these specific departments although major and minor subjects tend to coincide with departmental titles.

Heat-power Engineering. There are opportunities for both analytical and experimental studies at the graduate level in heat-power engineering. Opportunities for analytical studies include the fields of thermodynamics, heat transfer, combustion, fluid flow, power plants, refrigeration, and air conditioning. In the laboratories of

the Sibley School of Mechanical Engineering, experimental studies at the graduate level may be made of internal combustion engines, gas turbines, steam engines, steam turbines, pumps, compressors, fans, steam generating units, heat exchange apparatus, refrigerating equipment, air conditioning equipment, and engineering instruments. By proper choice of his minor fields of study, the heat-power major may acquaint himself with closely related sciences, such as chemistry, physics, and mathematics, or with engineering courses in the other departments of the school and college.

Machine Design. Unique instruction is offered in design and related subjects without duplication of work offered by other departments. The thesis and related courses may be concentrated in one of the following three fields or may overlap them: (1) design and development of a machine or component, (2) theoretical analysis of machine or component performance, including stress and vibration, and (3) an experimental investigation of performance. For the latter the department has its own laboratory, well equipped with the tools of experimental stress analysis, and instruments and machines of vibration analysis, bearing lubrication performance, and wear testing. Courses are offered on the subjects of creative design, automatic machinery, advanced design analysis, advanced kinematics, design problems in vibration and dynamics, automotive engineering, and machine design experimental laboratory. Special interests of the staff include the lubrication and performance of bearings under high speeds and dynamic and misaligning loads, gearing, impact stresses in machinery parts, endurance of shafts in machinery assemblies, and residual stresses. Students who major or minor in machine design usually take their other work in engineering mechanics, materials, materials processing, heat-power engineering, or industrial and engineering administration.

Industrial and Engineering Administration. Study and research may take place in such areas as (1) manufacturing control, including production, quality, and cost control; (2) methods engineering, which involves motion study, elemental standards, work simplification, and aspects of incentive payment; (3) production engineering, which involves equipment selection, tooling problems, lay-out and materials handling decisions, and the definition of manufacturing flow; (4) general procedures, systems, and organizational problems; and (5) the human relations aspects involved in all of the above areas including techniques for introducing new methods to employees and other employer-employee relationships. Profitable areas for study and personal development include the solution of industrial manufacturing and distribution problems from an economic point of view, the application of the techniques emerging from recent developments in mathematical and computational equipment, and the analytical approach developing in the field of Operations Research.

A course of study in the field of Applied Industrial Statistics as related to sampling inspection, quality control, the design of engineering laboratory, pilot plant, and plant experiments and applications in the area of manufacturing operations is also available. Students without an engineering background interested in industrial statistics should refer to the offering under the Field of Statistics elsewhere in this publication.

Materials Processing. A general survey on the advanced level will serve as the foundation for work on individual problems dealing with the principal features and specific details of machine tools, cutting tools, machinability of materials, work and tool holding devices, and gaging and inspecting methods. The laboratory provides modern and unique facilities for measuring performance and efficiency of machines, tools and accessories, testing and inspecting of equipment and parts, experimental investigations of new methods, and participation in research projects.

Engineering Drawing. Individual attention is available to students wishing to do research and development work in industrial applications and teaching.

METALLURGICAL ENGINEERING *(ENGIN.)*

Professors M. S. Burton, J. L. Gregg, *P. E. Kyle,* C. W. Mason.

APPROVED MAJOR AND MINOR SUBJECTS

Metallurgical Engineering 1, 2, 4

To qualify for admission, a student must have completed satisfactorily a course substantially equivalent in its technical content to the course leading to the degree of Bachelor of Metallurgical Engineering at Cornell University. Exact equivalency, subject for subject and credit hour for credit hour, is neither required nor expected, but the previous training must be such as to prepare the applicant for effective work in metallurgical engineering at the graduate level.

Minor subjects may be chosen, for example, from chemical engineering or other divisions of engineering, chemistry, physics, mathematics, business and public administration, or industrial and labor relations.

Candidates are expected to pursue a course of study that will give them a deeper understanding of the basic and applied sciences and will develop initiative and originality. Specific programs are planned to fit the objectives of the student and to develop original thinking. The student is not required to take any fixed series of courses; he can complete much of his graduate program through individually supervised work with members of the Faculty.

Research work for the thesis may be in specific fields of unit processes, process metallurgy, metallography, physical metallurgy, and foundry engineering.

PHYSICS *(ARTS)*

Professors L. L. Barnes, H. A. Bethe, G. Cocconi, D. R. Corson, (T. R. Cuykendall, Engineering Physics), J. W. De Wire, C. W. Gartlein, G. E. Grantham, K. I. Greisen, P. L. Hartman, J. A. Krumhansl, B. D. McDaniel, F. L. Moore, P. Morrison, H. F. Newhall, A. W. Overhauser, *L. G. Parratt,* (H. S. Sack, Engineering Physics), E. E. Salpeter, (B. Siegel, Engineering Physics), A. Silverman, L. P. Smith (Chairman), R. L. Sproull, D. H. Tomboulian, R. R. Wilson, and W. W. Woodward. (A. S. Eisenstein and C. Longmire, Visiting Professors for 1953–54.)

APPROVED MAJOR AND MINOR SUBJECTS

Physics 1, 2, 3, 4

Experimental Physics 1, 2, 3, 4

Theoretical Physics 1, 2, 3, 4

Biophysics 3, 4

Language requirement for the Master's degree: proficiency in French or German or an approved substitute before completion of the second residence unit, or before the beginning of the third calendar-term of residence.

The major and both minor subjects for the doctorate should not be chosen inside the field of physics.

The major subject for the doctorate may be called experimental physics only if accompanied by theoretical physics as a minor, and theoretical physics only if accompanied by experimental physics as a minor.

The major subject for the Master's degree must be in physics; the minor subject may or may not be in the field of physics.

Members of the staff are especially interested in directing graduate research in the following fields:

Experimental Physics. Nuclear physics; cosmic rays, atomic spectra; X-ray spectra; physical electronics; and physics of solids.

THEORETICAL PHYSICS. Quantum mechanics; quantum electrodynamics; theory of nuclei; fundamental particles; radiation; and the theory of the solid state.

A colloquium in general physics and a seminar in theoretical physics meet regularly, and seminars in special fields as arranged.

A booklet entitled *Graduate Work in Physics at Cornell* can be obtained by writing to the Chairman, Department of Physics, Rockefeller Hall. The booklet contains additional information about graduate work and research in physics for the entering graduate student.

STATISTICS *(AG. ARTS, ENGIN., I.L.R.)*

(See page 55.)

Members of the Staff

Index of Fields of Instruction and Approved Subjects